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COAST GUARD BOSTON MA MARINE SAFETY OFFICE
THE ARGO MERCHANT OIL SPILL ON-SCENE COORDINATOR'S REPORT.(U)
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6 The Argo Merchant Oil Spill
On-Scene Coordinator's Report .

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United States
Coast Guard

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ERRATA TO ARGO MERCHANT OIL SPILL OSC REPORT

<u>PAGE</u>	<u>SECTION</u>	<u>CORRECTION</u>
3	2.1 3rd line	Change "twenty-nine(29)" to "twenty-seven(27)"
3	characteristics	Change Cargo capacity from "1,359,000 bbls" to "242,078 bbls".
3	2.1 next to last line	Delete "Bunker C"
22	0837, 4th section	Change to read ". Large steam boiler to supply steam to cargo tank heating coils, enroute Providence, R.I. Plan is to weld on deck of supply vessel and reheat fuel oil cargo."
25	0745	Change "HUL" to "UH-1"
31	1245	Change "1 office" to read "1 officer"
31	1828, 4th line	Delete "contingency"
57	1440	Change "LT. J.G. POOLE" to "LT3C POOLE" where appearing
65	JAN 19, 0930 3rd line	Change "was" to " to be"
70	JAN 26, 1705 6th line	Delete "limited"
71	1607 3rd line	Change "of" to "or"
88	Vessels: CG Units	Add "5. CGC SPAR".
89	Army Equipment	Delete "One C-141".
91	5.1, 6th line	Change "7.7" to "7.5".
112	4th line	Change "N/V" to "M/V"
112	7.1.6, 6th line	Change "MSD" to "MSO"
115	7.2.1, 2nd line	Change "zone COTP/MSO" to "COTP/MSO zone"

THE ARGO MERCHANT OIL SPILL ON-SCENE COORDINATOR'S REPORT

Prepared by

United States Coast Guard
Marine Safety Office
Boston, Massachusetts

December 1977

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FRONTISPIECE — ARGO MERCHANT BEING BATTERED BY SEAS ON
FISHING RIP SHOAL, NANTUCKET, 22 DECEMBER 1976
(EPA Photo)

DEFINITION OF ABBREVIATIONS AND ACRONYMS

A

A/C	Aircraft
ADAPTS	Air Deliverable Anti-Pollution Transfer System
AFB	Airforce Base
AIRSTA	Air Station
ALCON	All concerned
A/N	Aid to Navigation
AOSS	Airborne Oil Sensing and Surveillance
ARS	Submarine Rescue Ship (USN)
ASAP	As soon as possible
AST	Atlantic Strike Team (CG)
ASW	Anti-Submarine Warfare

B

BMC	Boatswain's Mate Chief
BTT	Bathythermograph

C

CG	Coast Guard
CGAS	Coast Guard Air Station
CGC	Coast Guard Cutter
CNO	Chief Naval Operations
CO	Commanding Officer
COMDT	Commandant
CCGDONE	Commander, Coast Guard District One, Boston, Mass.

D

DOC/NMFS	Department of Commerce/National Marine Fisheries Service
DOC/NOAA	Department of Commerce/National Oceanographic and Atmospheric Administration
DOD/COE	Department of Defense/Corps of Engineers
DOD/USA	Department of Defense/U.S. Army
DOD/USAF	Department of Defense/U.S. Airforce
DOD/USN	Department of Defense/U.S. Navy
DOI	Department of Interior (U.S.)
DOI/FWS	Department of Interior/Fish and Wildlife Service
DOS	Department of State (U.S.)
DCS	District Chief of Staff (USCG)
DW	Deadweight
DWPC	Department of Water Pollution Control

E

EPA	Environmental Protection Agency (U.S.)
ERDA	Energy Research and Development Administration (U.S.)
ETA	Estimated Time of Arrival
ETD	Estimated Time of Departure

DEFINITION OF ABBREVIATIONS AND ACRONYMS (Continued)

F

FAA
F/V

Federal Aviation Administration
Fishing Vessel

G

GST

CG Gulf Strike Team (CG)

H

HEW
HUD

Health, Education and Welfare Agency (U.S.)
Housing and Urban Development Agency (U.S.)

I

IAW
I/R

In accordance with
Infrared

L

LOA

Length Overall

M

MAD Aircraft
M (Mag)
MEP
MIT
mph
MSO

Magnetic Anomaly Detector Aircraft
Magnetic North
Marine Environmental Protection
Massachusetts Institute of Technology
Miles Per Hour
Marine Safety Office (USCG)

N

NASA
nm
NRT
NWS

National Aeronautical and Space Administration (U.S.)
nautical mile
National Response Team
National Weather Service

O

OAN
OCEANO
OFF
OFF/ELT
O/S
OSC

CG Operations Division, Aids to Navigation Branch
CG Oceanographic Unit, Wash., D.C.
Offshore Fisheries Patrol (USCG)
Offshore Fisheries Patrol/Law Enforcement Patrol
On-Scene
On-Scene Coordinator
On-Scene Commander (USCG/SAR)

DEFINITION OF ABBREVIATIONS AND ACRONYMS (Continued)

P

POLREP

Pollution Report (USCG)

R

R&D

Research and Development

RDV

Rendezvous

RECON (recon)

Reconnaissance

RRC

Regional Response Center

RRT

Regional Response Team

R/V

Research Vessel

S

SAR

Search and Rescue (USCG)

SFC

Standard Cubic Feet

T

TAD

Temporary Additional Duty

TTS

Steam Turbine Tanker

U

USCG

United States Coast Guard

USCGD ONE

United States Coast Guard District 1

U/W

Underway

W

WMEC

Medium Endurance Cutter (USCG)

WX

Weather

X

XBT

Expendable Bathythermograph

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**DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD**

MAILING ADDRESS:

**Commanding Officer
CG Marine Safety Office
447 Commercial Street
Boston, MA., 02109**

November 1977

1. FOREWORD

This report factually documents the oil spill response action initiated by the United States Government following the grounding and subsequent foundering of the Liberian-registered tanker **ARGO MERCHANT** off the Northeast Coast of the United States at 0700 hours on December 15, 1976. The report was developed in accordance with Section 1504, Pollution Reports, of the National Oil Pollution Contingency Plan as published in Title 40, Code of Federal Regulations, Part 1510. This publication does not address the environmental damage resulting from the massive spill of No. 6 fuel oil, although this was a prime consideration during the entire oil spill response action. Investigations into the adverse environmental impact of the oil spillage are, in fact, still being conducted extensively under federal sponsorship.

The scientific investigations relative to the marine casualty have already been documented in a report published by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), entitled "The Argo Merchant Oil Spill — A Preliminary Scientific Report," March 1977. The grounding and resulting oil spill launched the most massive oil spill response action ever undertaken in the United States. The action was first and foremost a rescue mission directed by the U.S. Coast Guard On-Scene Commander. Later, U.S. Public Law 93-248,* Intervention on the High Seas, was invoked for the first time by the United States to minimize the threat of marine pollution to the coastal zone. This action was initiated by the District Commander after it had been determined that the grounding posed a definite threat to the coast and the contiguous zone and that adequate preventive measures were not being taken by the owners. The major response efforts continued from the time of the ship grounding through February 10, 1977, when it was finally determined that no substantial amount of oil remained in the wreck. The case remained open until June 16, 1977, with monitoring overflights and drift forecasts being made, among other scientific investigations. The incident was officially closed as of June 16, 1977.

This On-Scene Coordinator's report covers the following factors associated with the pollution incident:

- Description of the cause and initial situation;
- Organization of response action and resources committed;
- Effectiveness of response and removal actions by:
 - a. The discharger,
 - b. State and local forces, and
 - c. Federal agencies and special forces;

→ (cont on p. 2)

*Public Law 93-248 is presented in Appendix I.



**DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD**

MAILING ADDRESS:

- Unique problems encountered; and
- Recommendations on:
 - a. Means to prevent a reoccurrence,
 - b. Improvement of response actions, *and*
 - c. Changes needed to improve National or Regional Contingency Plans. *✓*

It is impossible to thank individually each person who actively participated in the response action. However, collectively, I would like to thank the representatives of the various federal agencies, industrial clean-up contractors, representatives of the Commonwealth of Massachusetts, the general public who provided suggestions to improve the response actions, and all those volunteers who treated oil-contaminated water fowl and remained on standby for shoreline clean-up. Fortunately, the spilled oil did not reach the U.S. shoreline, nor did it approach to within 12 miles as far as can be definitely determined. The untiring efforts of the personnel of the Coast Guard units involved and of the Atlantic Strike Team are worthy of special recognition.

L.N. Hein

L.N. Hein
Captain, U.S. Coast Guard
Marine Safety Office
Boston, Massachusetts

2. DESCRIPTION OF THE CAUSE AND INITIAL SITUATION

2.1 INITIAL SITUATION

At 0700 (7:00 a.m.) on December 15, 1976, the steam turbine-powered tanker ARGO MERCHANT, 18,743 gross registered tons, made bottom impact on a shoal known as "Fishing Rip" located at 41° 02' N Lat. and 69° 27.5' W Long, the position being geographically about twenty-nine (29) nautical miles southeast of Nantucket Island, Massachusetts (Figure 1). The vessel which was of Liberian registry was owned by Thebes Shipping, Inc. It had the following characteristics:

Deadweight tonnage	28,238
Draft	33.56 ft
Speed	15 knots
Fuel consumption	67 tons/day
Bunker fuel capacity	2076 tons
Year built	1953
Builder	Howaldtswerke A.G. Hamburg, Germany
Previous names	"VARI," "ARCTURUS," and "PERMINA SAMUDRA III"
Length overall	641.35 ft
Length between perpendiculars	595 ft
Beam	84.23 ft
Molded depth	44 ft
Cargo tanks	10 center, 20 wing
Cargo capacity	1,359,000 bbls
Pump rooms	1-4 pumps
Total pumping capacity	4,000 tons/hr
Engine	Steam turbine
Horsepower	12,000 at 100 shaft rpm

Figure 2 shows the general layout of the ARGO MERCHANT. When the vessel impacted the shoal, the water depth over the shoal was 21 feet. She was heading on a true course of 325 degrees and had a crew of 38 persons aboard. The vessel grounded from her midships to stern section and listed heavily to starboard. Water began to enter the engine room at an undetermined rate, and the pump room was rendered inoperative due to flooding. By 1000, the only power aboard the ship was provided by an emergency generator.

Weather conditions at the time of the grounding were quite severe, with 10-foot seas running from the Southwest, and a Southwest wind, blowing at 25 knots, creating a condition of Sea State 5.

The U.S. Coast Guard was first notified of the casualty at 0710 when the Coast Guard Station at Brant Point, Nantucket Island, received a call on Channel 16 FM from the ARGO MERCHANT stating she was aground from stern to midships, *position unknown*, carrying 27,500 long tons (7.5 million gallons) of No. 6 Bunker C fuel oil. The vessel further reported that the engine room was flooding and the vessel was in danger of capsizing.

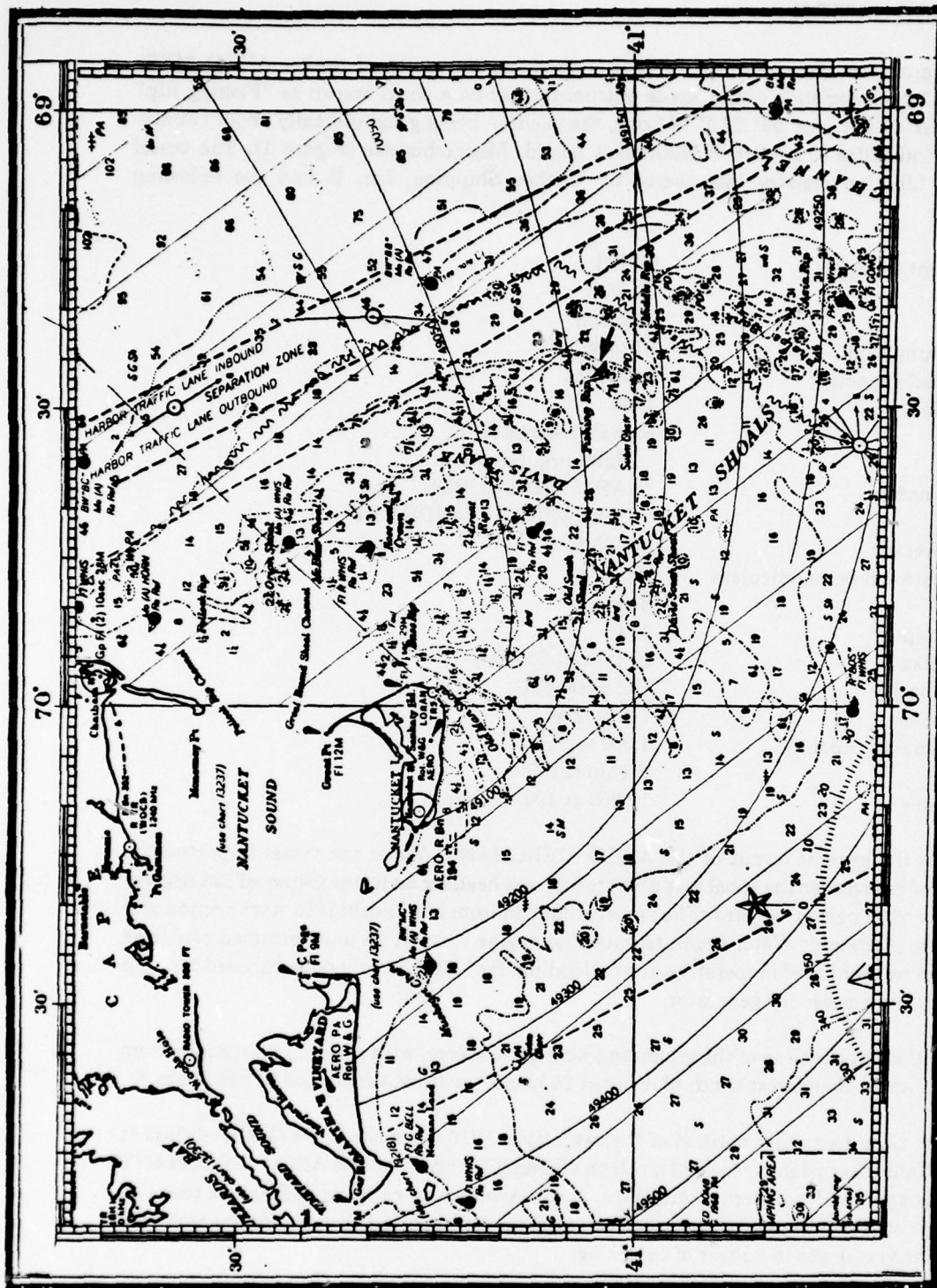


FIGURE 1 GROUNDING SITE OF ARGO MERCHANT

The U.S. Coast Guard cutters SHERMAN and VIGILANT, both on fisheries patrol in the vicinity of the stricken vessel, confirmed and monitored the distress call, as did a CG C-130 aircraft from Elizabeth City, N.C. The location of the casualty was confirmed by the patrol aircraft.

At 0830 the Master of the ARGO MERCHANT requested permission to pump fuel oil cargo overboard to control the draft and lighten the vessel. At 0915 the Master was denied permission to lighten the ship, but was advised to stand by for U.S. Coast Guard assistance. At this time there was no indication of oil leakage from the grounded vessel and the owner's U.S. agent immediately arranged for a commercial salvor and diver to visit the casualty scene to assess the extent of hull damage. Arrangements were also made by the agent for deep sea tug assistance.

The U.S. Coast Guard considered the situation to have the potential of becoming a major oil spill from the first notification of the casualty. Their first responsibility, however, was to aid the stricken seamen. The U.S. Coast Guard designated Captain L.N. Hein, Commanding Officer of the Boston Marine Safety Office (MSO), as On-Scene Coordinator (OSC) of the pollution operation and Captain H.M. Veillette, Commanding Officer of the U.S. Coast Guard cutter SHERMAN, as On-Scene Commander for the search and rescue operation. The CGC SHERMAN began to evacuate unnecessary personnel during the first day (15 December).

At 2100 on December 16, 1976, the OSCOMmander made the decision to evacuate the vessel. The pump and engine room bulkhead had buckled, and it was obvious that the ship could not be saved. The remaining crew, OSC reps, and Strike Team members were then safely removed from the stricken vessel by the U.S. Coast Guard helicopters. Some of the seamen were landed on the island of Nantucket, while others were landed on the cutters SHERMAN and VIGILANT. The operation was then designated as a "pollution incident" and the responsibility was redirected to U.S. Coast Guard Regional Response Center, Boston, with Captain L.N. Hein as the Federal OSCoordinator. Primary efforts were then directed to a countermeasure action for removing the cargo from the vessel or otherwise protecting the natural environment and the shoreline of the United States from oil contamination.

2.2 CASUALTY CAUSE

When the Master of the ARGO MERCHANT radioed his emergency that was received at 0710, December 15, 1976, at U.S. Coast Guard Station, Brant Point, Nantucket Island, the message stated that his "*position was unknown.*" At the time of the incident the vessel was heading from Porta La Cruz, Venezuela, to the Northeast Petroleum, Inc., Marketing Terminal, Salem, Massachusetts.

When the vessel grounded on Fishing Rip shoal, it was 12 nautical miles inboard of the normal traffic lane. As a result the vessel entered charted shoal waters having a mean low water depth of 21 feet (Figure 1). At the time of the bottom impact, the ship had an undetermined draft at the stern. With the engine and pump rooms flooded after grounding, the vessel's draft was observed to be 36 feet aft and 34 feet forward.

A Liberian tribunal has been held to investigate the cause of the casualty, the findings of which are incidental to this report of the U.S. Federal Government's oil spill response action.

[illegible]

FIGURE 2 STARBOARD SIDE ELEVATION (UPPER) AND DECK PLAN (LOWER) INDICATING LOCATION OF CARGO TANKS OF T.T.S. ARGO MERCHANT

3. ORGANIZATION OF RESPONSE ACTION AND RESOURCES COMMITTED

3.1 ORGANIZATION

Within one hour of the alert, Regional and National Response Teams were activated. Ultimately, the teams consisted of the following individuals.

Regional Response Team

Agency	Principal Members
DOC/NOAA	Katherine S. Baker John Robinson
DOD/COE	Irving M. Fistel
DOD/USA	Major David B. Murray (Ft. Devens) Lt. Victor Tromdad (Ft. Devens)
DOI/USGS	Dr. David Folger
US/EPA	John L. Conlon
USCG	Captain Walter Folger, Chairman Lt. C. L. Gregory
DOD/USAF	Nicholas Scurto (Hanscom AFB)
DOI/FWS	Arnold Julin
DOC/NMFS	Christopher Mantzaris
DOD/USN	Captain L. E. Dowley
Mass./DWPC	Glen Gilmore Hans Bonne William J. Marhoffer

Representatives of the following agencies were members of the National Response Team:

National Response Team

EPA	DOD/USA
USCG	DOC/NOAA
DOD/USN	DOI/FWS

ERDA
Justice Dept.
DOS

HUD
HEW

Also within the first hour after notification of the emergency, the U.S. Coast Guard Atlantic Strike Team (AST*) was requested to provide spill response service and equipment at the site of the ARGO MERCHANT disaster.

3.2 CRITICAL HOUR LOG

December 15, 1976 — Wednesday

- 0700 ARGO MERCHANT aground on Fishing Rip Shoal (Figures 3 and 4).
- 0800 MSO Boston notified of ARGO MERCHANT grounding, and the following actions were taken:
- a. The applicable Federal and State agencies were notified of the situations.
 - b. The oil spill contractors under fiscal contract to CCGDONE were placed on standby.
 - c. Capt. Hein, the predesignated Federal On-scene Coordinator, proceeded to CG Air Station, Cape Cod, for an overflight of the stricken vessel.
 - d. LCDR Cowley, Port Operations Officer, proceeded to CG Air Station, Cape Cod, to set up a temporary OSC Command Post, make arrangements for a temporary Public Affairs Office, and formulate logistic requirements.
 - e. BMC Cramer, MEP investigator, was placed on board the ARGO MERCHANT to act as OSC's representative on-scene.
 - f. Note: Capt. Hein was directed by CCGDONE to report to the RRC at the conclusion of his overflight.
- 0830 Ship's Master requested permission to discharge oil cargo into the sea to control the vessel's draft.
- 0900 Received message that ARGO MERCHANT engine room flooding and all power secured, except emergency generator. *Note:* This meant that steam into cargo compartment oil heating coils was no longer available and that the temperature of the oil cargo would gradually be lowered to the ambient sea and air temperature which was specifically — seawater 43°F (6°C) and air 46°F (8°C). Oil cargo is generally maintained at a temperature of 90° to 120°F (32°C-48°C) to facilitate the pumping transfer of the cargo from ship to shore. At lower temperatures the oil can become difficult, if not impossible, to pump.

* The USCG/AST is one of three teams strategically located around the United States. They are trained and equipped to respond to marine pollution incidents.



FIGURE 3 ARGO MERCHANT ON 15 DECEMBER 1976

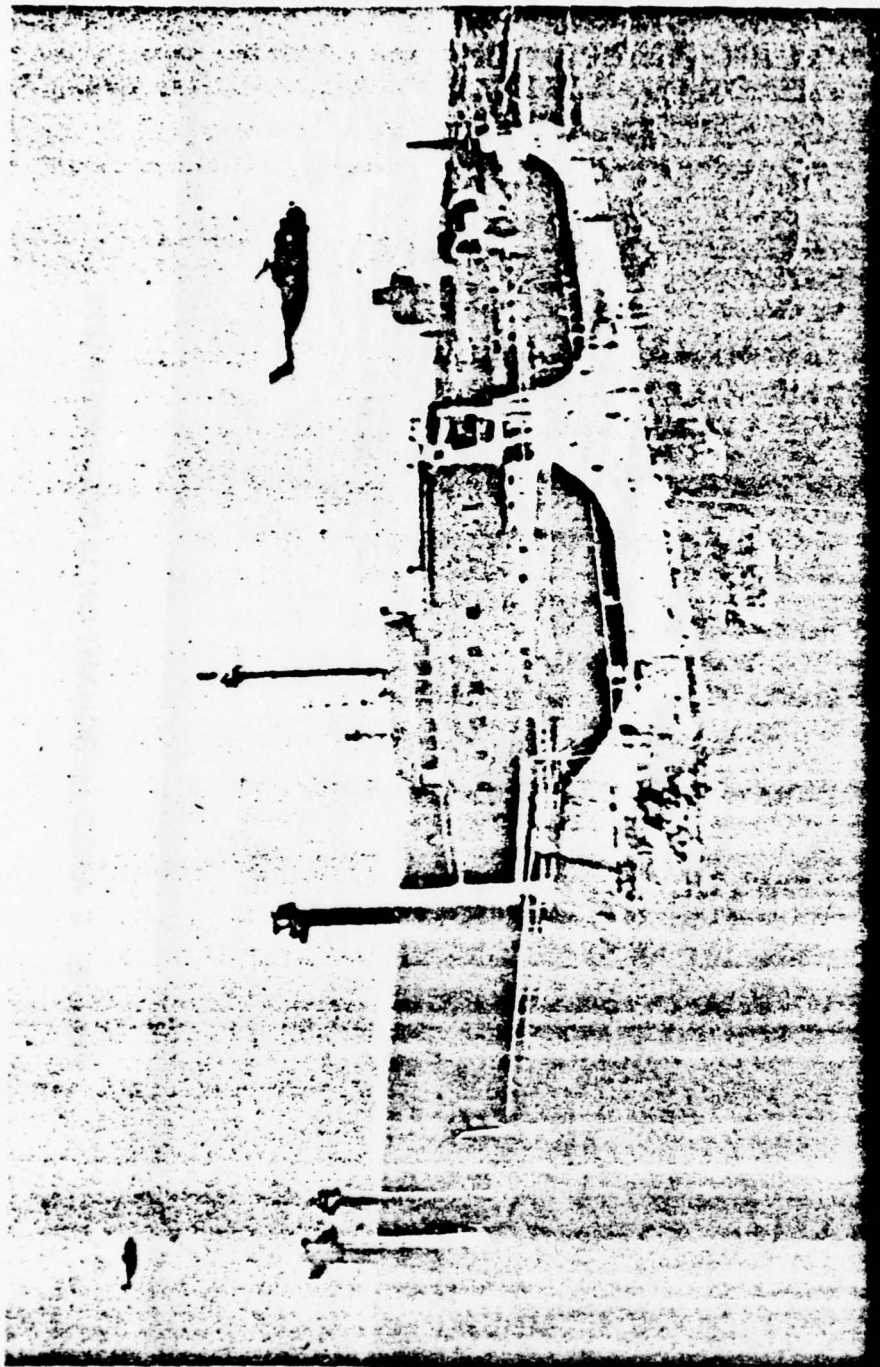


FIGURE 4 ARGO MERCHANT ON 15 DECEMBER 1976

- 0915 Permission to discharge oil cargo denied, CG O/S assistance was to be provided in attempt to prevent the need for pumping vessel's cargo into the sea. The ship's pumps were inoperable due to flooded engine room. The situation was evaluated as a potential major spill.
O/S WX winds 230°T/25 kts., seas 230°T/10 ft., vis. 8 miles.
- 1000 The Commandant of the Coast Guard was verbally requested by CCGDONE to invoke U.S. Public Law 93-248, Intervention on the High Seas Act.
- 1115 The U.S. Coast Guard cutter SHERMAN having been diverted from offshore fishery patrol arrived at the ARGO MERCHANT. Later a damage control party from the SHERMAN boarded the grounded vessel.
- 1200 Authority to invoke Intervention Convention requested by formal communication to COMDT. USCG.
- 1230 Atlantic Strike Team (AST) departed Elizabeth City, North Carolina, for Cape Cod, Massachusetts, to provide spill response assistance.
- 1300 U.S. Coast Guard cutter VIGILANT diverted from offshore fishing patrol, arrived ARGO MERCHANT grounding site, and additional U.S. Coast Guard damage control personnel boarded stricken vessel.
- 1347
- First discharge of fuel oil cargo into Atlantic Ocean observed;
 - AST proceeds to casualty site with three ADAPTS pumping systems;*
 - Regional Response Team (RRT) in session;
 - U.S. Navy divers dispatched to scene, but recalled due to change in vessel's condition;
 - OSCommander assigned four U.S. Coast Guard helicopters and fixed-wing aircraft for response assistance and aerial surveillance.
- 1425 MSO Boston advised by owner's representative in New York City that salvage operations assigned through London Salvage Co., New York City, and Jet Line Services. Latter assigned to boom vessel in grounded condition and clean up spilled oil.
- 1435 AST arrived at Cape Cod, Massachusetts.
- 1455
- U.S. Coast Guard damage control party reported flooding in engine room to be at level of 19 feet. Did not consider engine room to be holed. High concentration of fuel oil indicative of flooding of fuel tanks forward of engine room, displacing bunkers into engine room. Reported that onboard stability charts indicated vessel would float with engine room flooded, but that decks would be awash with 4 to 6 feet of freeboard aft. Extreme venting through sealed hatches indicated that forward cargo tanks had opened to sea.

* ADAPTS (Air Deliverable Anti-Pollution Transfer System) consists of a prime mover (diesel engine), a submersible pump, an "A" frame-tripod assembly, and a fuel cell.

- Ship owner's representative notified U.S. Coast Guard that Murphy Pacific Co. (a professional marine salvor organization) would assume responsibility for ship salvage effort.
 - Master of ARGO MERCHANT would not make statement or recommendation concerning vessel's ability to remain afloat under tow. Cutter VIGILANT advised to tow in Northwest direction, should decision be made to tow vessel to safe anchorage, since best water conditions existed Northwest of casualty area.
- 1500
- Commercial tug MARJORIE B. McALLISTER and barge NEPCO 140 (70,000 bbl. capacity) hired for lightering ship by offloading oil cargo. Adverse weather and tidal conditions precluded towing action until morning of December 16, 1976.
 - U.S. Coast Guard Commandant authorized enactment of Intervention Convention Act, after it had been determined that the grounding posed a definite threat to the coast and the contiguous zone, and that adequate preventive measures were not being taken by the owners. Spill response contingency funding authorized at financial expenditure limit of \$500,000.
 - Lightering of vessel by pumping seawater overboard continued during ensuing hours.
- 1930
- The ARGO MERCHANT lost emergency electrical power due to flooding; 11 crew members and 5 U.S. Coast Guard personnel and 8 crew members were now aboard the vessel. U.S. Coast Guard cutter VIGILANT moved in closer to the shipwreck to help maintain ship-to-shore and ship-to-ship communications.
- 2000
- USCG/AST and OSC rep., Executive Officer, Marine Safety Office, boarded ARGO MERCHANT.
- 2100
- Weather — visibility 6 mi.; wind 210°T/9 kts.; temperature 46°F (8°C); barometer falling at 31.05; seas 4 feet.
- 2230
- First ADAPTS pump delivered to spill site by U.S. Coast Guard helicopter.
 - On-site Response Team recommended that safety broadcasts concerning grounding be relayed to all shipping, since ARGO MERCHANT was lying from midship to stern without lights, aground in 5 to 6 fathoms of water. Vessel listed 5 degrees to starboard.
 - MSO representative onboard reported aft pump room flooded to 25 feet with oil and seawater. Main engine room flooded to 21 feet with 5-foot head of oil. AST onboard attempted to dewater engine room, requested that salvage master be brought aboard as soon as practical, and that tugs and barges be brought on scene for dewatering and possible unloading of oil cargo.

December 16, 1976 — Thursday

- 0100 Arrangements made with Moran Towing Corp. of Boston for services of tug SHEILA MORAN.
- 0147
- U.S. Coast Guard personnel onboard reported water level 1½ feet below portholes and rising. They abandoned afterdeck house and moved all hands to forward deckhouse.
 - Weather — visibility 10 mi.; wind 070°T at 5 kts.; seas 040°T 2 feet; temperature 44°F; barometer 29.99.
- 0200
- Murphy Pacific salvage master boarded ARGO MERCHANT.
 - U.S. Coast Guard helicopter delivered four additional salvage personnel and pump parts.
 - Total personnel aboard: eight Coast Guard, eight crew, and four commercial salvors.
- 0400
- AST started using first ADAPTS pump to dewater engine room.
 - CALICO JACK offshore supply vessel placed on alert.
- 0430 Engine room liquid level reported at 40 ± feet.

Equipment Inventory (0430 16 December 1976)

The following U.S. Coast Guard units were committed to the response action:

MSO Boston
CGC SHERMAN SAR, OSCommander
CGC BITTERSWEET, delivering pumps
CGC VIGILANT, support
Gulf Strike Team
Atlantic Strike Team
Air Station Cape Cod
Group Woods Hole, Mass.
CGC SPAR — enroute Woods Hole, Mass.
Air Station, Elizabeth City, N.C.
Air Station, St. Petersburg, Fla.

The following equipment was sent to the Coast Guard Air Station Cape Cod via aircraft:

- (1) Two Yokohama fenders,
- (2) High seas containment booms — three containers,
- (3) ADAPTS pump systems.

The following equipment was dispatched to scene:

- (1) Tug MARJORIE B. McALLISTER and barge NEPCO 140 (70,000 bbl capacity) by OSCoordinator,
- (2) Tug SHEILA MORAN by OSCoordinator,
- (3) Two Army Skycrane helicopters from Ft. Eustis,
- (4) Tug CURB provided by owners enroute from Key West, Florida,
- (5) Sanchez tug by owners from New Bedford, Mass., for transportation and report as necessary.

Plans — Continue to mount response, dewater engine room, and attempt to refloat vessel. Directed BITTERSWEET to load and deliver two additional ADAPTS pumps, since WX forecast for 16 December precluded use of helicopters.

- 0900 Hired second tug MOIRA MORAN and barge NEW JERSEY (40,000 bbl. capacity).
- 1200 Requested USN Superintendent of Ship Salvage to represent OSC as salvage master.
- 1252 Water flooding under control, but vessel still aground. Pumping of engine room continued, with water level lowered 7 feet. Apparent source of flooding was ruptured sea valve. Oil in engine room was coming from pump room, due to ruptured cargo line. Little movement of vessel which appeared to be bedding into sand. List improved to 5 from 7 degrees; draft forward 34 feet, aft 36 feet. No pollution (oil leakage) observed from vessel. Starboard gunwale awash. No evidence of holing in forward tanks.

The following sea conditions were observed and reported by CGC VIGILANT:

Information regarding currents with 1 nm of disaster area —

- (1) Generally followed the Pollock Rip rotary currents, as shown on Chart NR 13200. Currents experienced were a combination of the rotary diagrams approximately 20 miles South and East of grounding position. Current toward West had strengthened to 3 knots over Fishing Rip Shoal, exerting considerable pressure on hull of VIGILANT. CGC VIGILANT was using fathometer to chart water depth within 2-m. radius around Fishing Rip Shoal.

Weather — Visibility 1 mile in rain and fog; wind, 050°T at 13 kts.; seas set at 070°T at 2 ft.; air temperature 45°F; sea temperature 41°F, barometer 29.62.

- Personnel onboard; three CG/AST, one owner's representative, and five crew members.

- 1457 U.S. Coast Guard determined salvage efforts of owner/agent inadequate; no tug or barge hired; no effort to marshal salvage equipment; OSC notified master and owner/agent of ARGO MERCHANT that the United States through U.S.C.G. was assuming complete control of efforts to eliminate pollution threat.

- 1500 CGC BITTERSWEET delivered two additional ADAPTS pumping systems.
- 1600 OSCommander requested that all civilian flights enroute casualty site be cleared by OSCommander due to poor visibility and large number of aircraft flying over ARGO MERCHANT. Civilian aircraft causing unnecessary hazards during salvage operations. FAA unable to regulate due to it being international airspace.
- 1730 Tug SHEILA MORAN on-scene.
- Weather* — Visibility 2 mi., rain, wind 045°T at 10 kts., seas from 045°T/3-4 feet; current setting 070°T/3 knots.
- 1800
- Swell build-up alongside ARGO MERCHANT to 5-6 feet, with currents from stern sweeping around her bow.
 - Academic consultants, Drs. Milgram and Kern of Massachusetts Institute of Technology, visited site.
- 1830 Flooding out of control; ship's structure screaming from stresses.
- 1930 Gulf Strike Team personnel arrived at Cape Cod.
- 2100 USN ship salvage personnel reported to OSC.
- OSCommander decided to evacuate vessel. Pump room and engine room bulkheads buckled; OSCommander decided ship could not be saved. Primary efforts directed toward controlled removal of oil cargo to reduce discharge to open sea.
 - U.S. Department of Commerce, National Weather Service (NWS), requested to forecast Fishing Rip area weather for duration of response action; NWS forecasted "Northeaster" was enroute with 15-25 knot winds, increasing to 20-35 knots, and would arrive following afternoon and evening.
 - U.S. Coast Guard requested U.S. Army UH-1 helicopter to ferry OSC personnel and equipment between Boston and Cape Cod, Mass.
- 2139 Evacuation of remaining 16 persons onboard commenced.
- 2300 Evacuation completed with key crew members left aboard CGC SHERMAN.
- 2355
- USCG/LCDR Chambers of AST reported shipboard conditions as follows:
Hull fairly well grounded headed 315°T with starboard side unworkable due to seas breaking over deck. Ports were awash on starboard side after-deckhouse with flooding in staterooms. Vessel had 6- to 10-degree list to starboard. Water in engine room had oscillating surges up to four feet. Pump room and engine room bulkheads buckled due to hogging.* Originally there was no cargo in Nos. 1, 5, and 7 port and

* Arching movement of bow and stern with midships section of keel pivoted on shoal and bow and stern free.

starboard wing tanks. All tanks, except 6, 7, 8, 9, and 10 starboard, were inspected and found to contain oil. When some ullage holes were opened, cargo was pushed out, indicating tanks could be open to the sea. Tank 7 port contained oil and water. Tank 6 center had a 10-foot water bottom. Cargo temperature was approximately 100°F on December 15.

- Tug SHEILA MORAN and CGC VIGILANT maintained watch on ARGO MERCHANT with searchlights to observe any oil discharge.

December 17, 1976 — Friday

- 0232 USAF C-141 aircraft enroute Coast Guard Air Station, Cape Cod, with Lockheed oil skimmer aboard.
- 0236 CGC BITTERSWEET enroute scene with buoys and mooring system for oil retention boom and/or lightering operations.
- 0302 Coast Guard C-130 aircraft enroute Coast Guard Air Station, Cape Cod, with two additional "high seas" oil-containment barriers.
- 0430
- Tug MARJORIE B. McALLISTER and barge NEPCO 140 on-scene in lee of Nantucket.
 - Weather too rough to work aboard or alongside ARGO MERCHANT.
 - Declared a medium spill of between 10,000 and 100,000 gals; still probability of major spill due to working of vessel under adverse weather conditions.
 - Laid groundwork for obtaining an emergency oil dumping permit from US/EPA, should disposal of vessel at sea be determined to be the best response action.
- 0640 CGC BITTERSWEET on-scene reported weather as overcast, 5-mile visibility in rain and snow; wind 000°T/25 knots; seas from 035°T/5-8 feet. Due to worsening weather, requested and received permission to proceed to more sheltered waters.
- 0742 CCGDONE issued message stating that since all personnel onboard had been evacuated, the case was closed for search and rescue purposes and that any further boardings of the vessel should be only in conjunction with pollution and/or salvage operations.
- 0854 ARGO MERCHANT still intact. A moderate slick extended from bow to stern. Following response units on scene:

CGC SHERMAN
CGC VIGILANT
Tug SHEILA MORAN
Tug MARJORIE B. McALLISTER
Barge NEPCO 140

List fluctuated from 5 to 10 degrees. Vessel was settling deeper into sand, and the water was washing over the main deck astern. Oil was apparently being discharged from ruptured lines and open tank tops. Slick was 150 feet wide, extending downwind as far as could be seen. With weather worsening, AST and GST personnel equipped vessel with battleship fenders for alongside mooring. Skimmers, ADAPTS pumping systems, and high seas boom awaited lull in weather to employ lightering and salvage efforts.

- 0930 CGC VIGILANT directed by CCGDONE to assume OSC for SAR. CGC SHERMAN was to evacuate vessel personnel remaining aboard SHERMAN at earliest opportunity, ashore. CG helicopter aboard SHERMAN to return to CG Air Station, Cape Cod.
- 1145 Last remaining crew of ARGO MERCHANT (12) were enroute Nantucket Island and three crew members were enroute to CG Air Station, Cape Cod. CGC SHERMAN case closed for SAR purposes.
- 1315 CGC VIGILANT reported on-scene weather had moderated. Visibility 10 miles, seas 275°T/2 feet. Vessel appeared stable enough to place personnel aboard. Tug MARJORIE B. McALLISTER and barge NEPCO 140 remained in lee of Nantucket Island due to weather forecast and lack of means to pump oil.
- 1347 Chief Naval Operations, Washington, D.C., requested Supt. of Salvage be tasked to provide technical assistance as required. Also requested to be advised of the scope of USN anticipated assistance, including requirement for fleet equipment and gear.
- 1430 OSC meeting held at CG Air Station, Cape Cod, with USN Supt. of Salvage, salvage masters, owners' representatives, and AST to evaluate situation and explain Intervention Act and future actions thereunder.
- 1448 NWS Boston requested to supply 6-hour forecasts of weather conditions for Fishing Rip area.
- 1500 Murphy Pacific Salvage Company released by owner/agent, reassigned to head salvage effort by USN on OSC request, due to standing contract with them.
- 1635
 - Coast Guard helicopter conducted overflight of ARGO MERCHANT to determine characteristics of oil slick.
 - Tug MOIRA MORAN from New York City and barge NEW JERSEY underway to scene.
 - Coast Guard helicopter placed three AST personnel aboard wreck from CGC VIGILANT. Found ADAPTS units strewn about and damaged by sea.
- 1725 Coast Guard Oceanographic Unit representatives asked to provide periodic oil spill trajectory forecasts.
- 2026 Conflicting information concerning ARGO MERCHANT and spill response action being given to news media from multiple sources, according to CCGDONE message.

To ensure factual and accurate information releases, all inquiries for information were referred to U.S. Coast Guard Public Information Officer, Boston.

- 2127
 - CGC VIGILANT reported stricken vessel still showing movement, specifically pitch and roll, and appeared to have settled another 3 feet. Seas were breaking over second deck, with first deck awash, aft.
 - CGC BITTERSWEET returned to scene.
 - Tug MOIRA MORAN with barge NEW JERSEY ETA O/S 1200, 18 December.
- 2300
 - Captain A. Kirchoff, Murphy Pacific, was designated Salvage Master and made responsible for coordinating all efforts with OSC.
 - U.S. Coast Guard personnel from MSO, Portland, Maine, and MSO Providence, Rhode Island, sent to assist OSC on temporary duty assignment.
 - U.S. Army helicopter was standing by at CG Air Station, Cape Cod, to assist as necessary. Attempts to obtain AOSS equipment A/C from CG Air Station, San Francisco, CA., revealed it to be temporarily inoperative.

December 18, 1976

- 0010 CGC SPAR proceeded to spill site to attach two Yokohama* fenders to port side of ARGO MERCHANT and assist in uncaging ship's anchor (intent being to position anchor in manner that would restrict ship's movement).
- 0830
 - Vessel remained aground, heading 250°T, listing, 15 degrees to starboard. Vessel motion was slight, a combination of pitch and yaw. Draft reading of port bow was 32 feet, and freeboard immediately aft of forward deckhouse on starboard side was zero. Occasional waves broke as high as the stack (Figure 5). After-starboard lifeboat missing since previous day and was surmised to be adrift. Pollution significantly reduced, with very little oil coming from ullage openings. Composition of slick was unchanged, but tended to run to the Southeast and was dissipating rapidly. Heavy patches of oil about 2 inches thick and 10 feet in diameter were evident, but slick observed 17 December had reduced by about one third.
 - Tug MOIRA MORAN and barge directed to standby in Nantucket Sound until further notification.

*Large rubber fenders that permit vessels to tie alongside each other and prevent grinding of hulls; 9 ft dia., 18 ft long, 5000 lb.



FIGURE 5 ARGO MERCHANT ON 18 DECEMBER 1976

- 0837 • Wind 340°T/30 knots, visibility 10 miles, seas 280°T/4 feet, swells 270°T/3 feet (combined height of 7 feet).
- One FWS overflight for waterfowl survey and two U.S. Coast Guard helicopter overflights were made for probe drops to measure current, photograph wreck, and general aerial surveillance, also to accommodate personnel and equipment.
- Transporting barge moorings from Cheatam Annex, Va.
- Large steam boilers to heat cargo compartment steam heating coils enroute Providence, R.I. Plan is to weld on deck and reheat fuel oil cargo.
- 1029 Oil cargo loss assessed at over 100,000 gallons and declared a *major spill*.
- 1318 OSC requested that CG Station, Brant Point, conduct shoreline inspections of Nantucket Island from Madaket to Great Point for signs of pollution.
- 1700 Salvage Master Capt. Kirchoff, based on survey from helicopter, indicated that ARGO MERCHANT'S condition was stable, fairly sound structurally, and would remain grounded. Oil discharge was reduced somewhat, possibly due to cooling of the oil.
- 2048 CGC VIGILANT and tug SHEILA MORAN remained on scene. Tug MARJORIE B. McALLISTER, with barge NEPCO 140 and tug MOIRA MORAN, with barge NEW JERSEY, sought shelter in the vicinity of Nantucket and were awaiting orders. CGC SPAR and CGC BITTERSWEET were moored at CG Base, Woods Hole, awaiting orders. WX — winds 275°T/25 kts., seas 275°T/6 ft.

December 19, 1976

- 0810 CGC VIGILANT reported conditions of ARGO MERCHANT remained unchanged. Pollution stream tended 100°T and consisted of patches of heavy oil irregularly shaped from very small to 1,000 sq. ft.; slick easily visible for 3 miles.
 - 0840 Forecast limits of oil slick were: 41°05'N, 69°35'W; 41°05'N, 68°40'W; 40°15'N, 68°40'W; 40°15'N, 69°05'W.
 - 1025 CG Station, Brant Point, completed inspection of Nantucket shoreline from Sankaty Light to Madaket; no pollution reported.
 - 1157 OSC COMMAND POST was established at Coast Guard Air Station, Cape Cod. Offshore supply boat CALICO JACK readied to depart for scene of ARGO MERCHANT, with CURB acting as support vessel. Lightering operation planned, weather permitting.
- The response plan was to install a steam boiler on the deck of the CALICO JACK and, through the medium of flexible steam hoses and portable steam heating coils which were aboard the ARGO MERCHANT, to heat the oil cargo in center tank No. 4 and

then pump the heated oil to either of two lightering barges. The exhaust steam from the heating coils would be directed into other cargo compartments from which the heated oil would be transferred by the ADAPTS pumping system into center tank No. 4, the prime transfer tank, for eventual offloading into the lightering barges. In this manner, using center tank No. 4 as the main transfer tank, the ship could be offloaded, lightened, and refloated.

- 1210 Datum marker buoy was located in position 40°53'N, 69°14.9'W.
- 1345 Army Skycrane lowered two Yokohama fenders to port side of ARGO MERCHANT and removed pallet containing complete ADAPTS equipment.
- 1400 Seven Strike Team personnel were placed on board the ship (Figure 6) to rig fenders. Use of a battery-powered A/N light of suitable power and characteristics planned for vessel as a warning to shipping.
- 1425 Vessel condition remained unchanged, as did pollution, except that stream was then tending 300°T.
- 1428 Total money expenditures at this time were \$486,000.00, an additional \$1 million was requested and approved.
- 1445 Tug SHEILA MORAN placed port anchor of ARGO MERCHANT 030° relative from bow, one shot (15 fathoms) at the water's edge.
- 1654 OSC requested aircraft with infrared and normal aerial photography capability with related processing assembly and interpretation support. A/C deemed necessary to monitor extent and drift of oil slick from ARGO MERCHANT. A/C was to be placed under OPCON of OSC and would be required to perform daily recon flights.
- 1714 CG helicopter with a full crew also requested to be assigned to OSC for response to pollution incident. A/C to be dedicated to pollution response until released by OSC.
- 1752 A Coast Guard helicopter removed seven Strike Team members from ARGO MERCHANT after they completed running out port anchor with Tug SHEILA MORAN and brought CGC VIGILANT crew member with fractured ankle to Air Station dispensary for treatment, only known personnel casualty during this complete operation.
- 1916
 - Discharge of oil to date estimated at 1.5 million gallons. Yokohama fenders in position. Datum market buoy was released for oceanographic study.
 - Four NAVY Marko MK V skimmers arrived at Coast Guard Air Station. At this time one ADAPTS had been recovered from vessel and the status of the other two ADAPTS was in question, due to the beating they had taken in boarding seas. A salvage conference was conducted at the Coast Guard Air Station, Cape Cod. A press conference with OSC and District Commander in attendance was conducted at First CG District later in the afternoon.

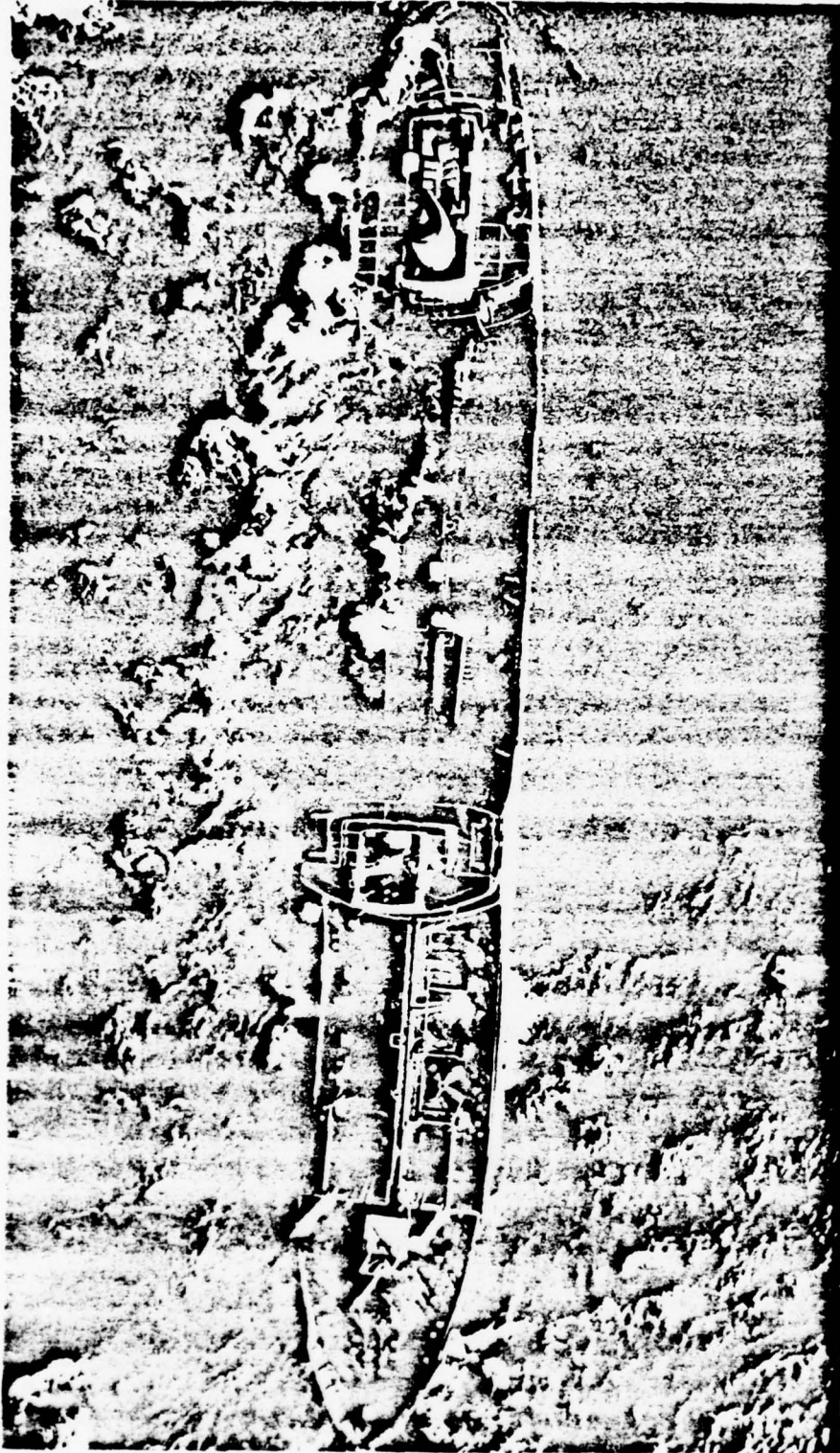


FIGURE 6 ARGO MERCHANT ON 19 DECEMBER 1976 (EPA Photo)

- CGC VIGILANT conducted detailed soundings within one mile of the ARGO MERCHANT.
- 2000
- Mobile team inspected 50 percent of Nantucket Island shoreline for possible pollution. Vessel condition unchanged with near-wreck oil slick direction varying with direction of rotary current.
 - Cloud-free infrared (IR) satellite images from NOAA-5 and SMS-GOES (35N-45N, 60W-75W) are requested for use in oil drift forecasting to be made available in real-time.
- 2136
- Consulted with EPA specialists (Las Vegas, Nevada) in the field of IR imagery as it related to oil spills. They indicated that time visual reconnaissance (recon) was the best method of tracing an oil spill in open sea environment. Visual recon handled by U.S. Coast Guard assets was available.

December 20, 1976

- 0036
- CGC SPAR was enroute to the scene with Capt. Kirchoff of Murphy Pacific on board with 15 shots of chain, and two barge moorings, which included two 12,000-lb sinkers and two 8,000-lb anchors.
- 0453
- CGC BITTERSWEET was enroute Nantucket Shoals with same equipment.
- 0745
- ARMY HUL helicopter utilized to return OSC to CGAS Cape Cod.
- 0830
- CGC SPAR on scene to set moorings.
- 0927
- A Coast Guard helicopter delivered six Strike Team personnel and equipment to the ARGO MERCHANT and removed inoperative current probe from CGC VIGILANT. Yokohama fenders had been thrown on deck by force of waves.
- 1037
- CGC BITTERSWEET on-scene to set moorings.
- 1113
- Vessel condition remained as before, vessel aground with 15-degree list, heading 239°T at position 41°02.2 N, 67°27.5 W (Figure 7). Tug SHEILA MORAN placed port anchor of ARGO MERCHANT 030° relative to bow of vessel.
 - ARMY recon flights were cancelled after discussion with EPA.
 - Weather — Winds 210°T/11 kts., seas negligible, visibility and ceiling unlimited, barometer 29.77.
 - Strike Team ran out starboard anchor. CGC SPAR on scene setting moorings and gear with salvage master onboard. Depth chart was passed to CGC SPAR by the CGC VIGILANT.
- 1135
- Strike Team rigged an aid to navigation light on ARGO MERCHANT. Making preparations for transfer operations.



FIGURE 7 ARGO MERCHANT ON 20 DECEMBER 1976

- 1218 ARMY Skycrane removed both Yokohama fenders from deck of ARGO MERCHANT and placed them in the water.
- 1400 Globe of oil had greatly reduced and the slick was now tending toward 270°T. Tug CURB was enroute scene. Tug MARJORIE B. McCALLISTER and NEPCO barge 140 were moored at New Bedford. CGC VIGILANT's small boat is attempting to aid SHEILA MORAN in placing starboard anchor and assisting Strike Team in securing fenders.
- 1415 Four mooring buoys were placed on port side of tanker by CGC BITTERSWEET and CGC SPAR. Each was moored with sinker with one shot, 2 1/2-inch chain and 600-ft wire rope. Bearings were to stack of ARGO MERCHANT.
- 1443 A Coast Guard overflight was made with the COMMANDANT, First Coast Guard District Commander, and EPA administrator onboard. A Coast Guard helicopter delivered supplies to Coast Guard Cutter VIGILANT and hoisted salvage master Capt. Kirchoff from Coast Guard Cutter SPAR.
- 1515 Tug CURB arrived on-scene and a depth chart was transferred from CGC VIGILANT. Tug SHEILA MORAN and CGC VIGILANT's small boat retrieved one Yokohama fender that went adrift and moored same to mooring buoy.
- 1625 A Coast Guard helicopter removed all Strike Team personnel from the ARGO MERCHANT.

Weather — Winds 160°T/20 kts., visibility 5 miles, barometer 29.56 F and seas 260°T/1 foot. Tug SHEILA MORAN was to place starboard anchor A.M. December 21, utilizing 150 feet of 5-inch nylon hawser received from CGC VIGILANT as directed by OSC. A representative from the EPA was asked to report to OSC to assist in contingency planning in preparation of possibility of oil coming ashore on Nantucket Island, also to see that a disposal site was designated by MDWPC in preparation of possible oily waste taken from Nantucket Island.

- 2005 Vessel condition remained unchanged and the extent of the pollution was unknown due to darkness. CGC VIGILANT and tug SHEILA MORAN were standing by ARGO MERCHANT. CGC SPAR enroute Portland, Me., and CGC BITTERSWEET enroute Woods Hole. Tug MOIRA MORAN with barge NEW JERSEY was anchored in the vicinity of Nantucket. Salvage vessel CURB was enroute Vineyard Sound, due to radar problems.

Weather — Winds 180°T/25 kts., seas 190°T/2 feet, barometer 29.45, visibility 7 miles, temperature 51°F.

- 2121 Mr. William Tripp, EPA representative, to report to OSC A.M. 21 December.

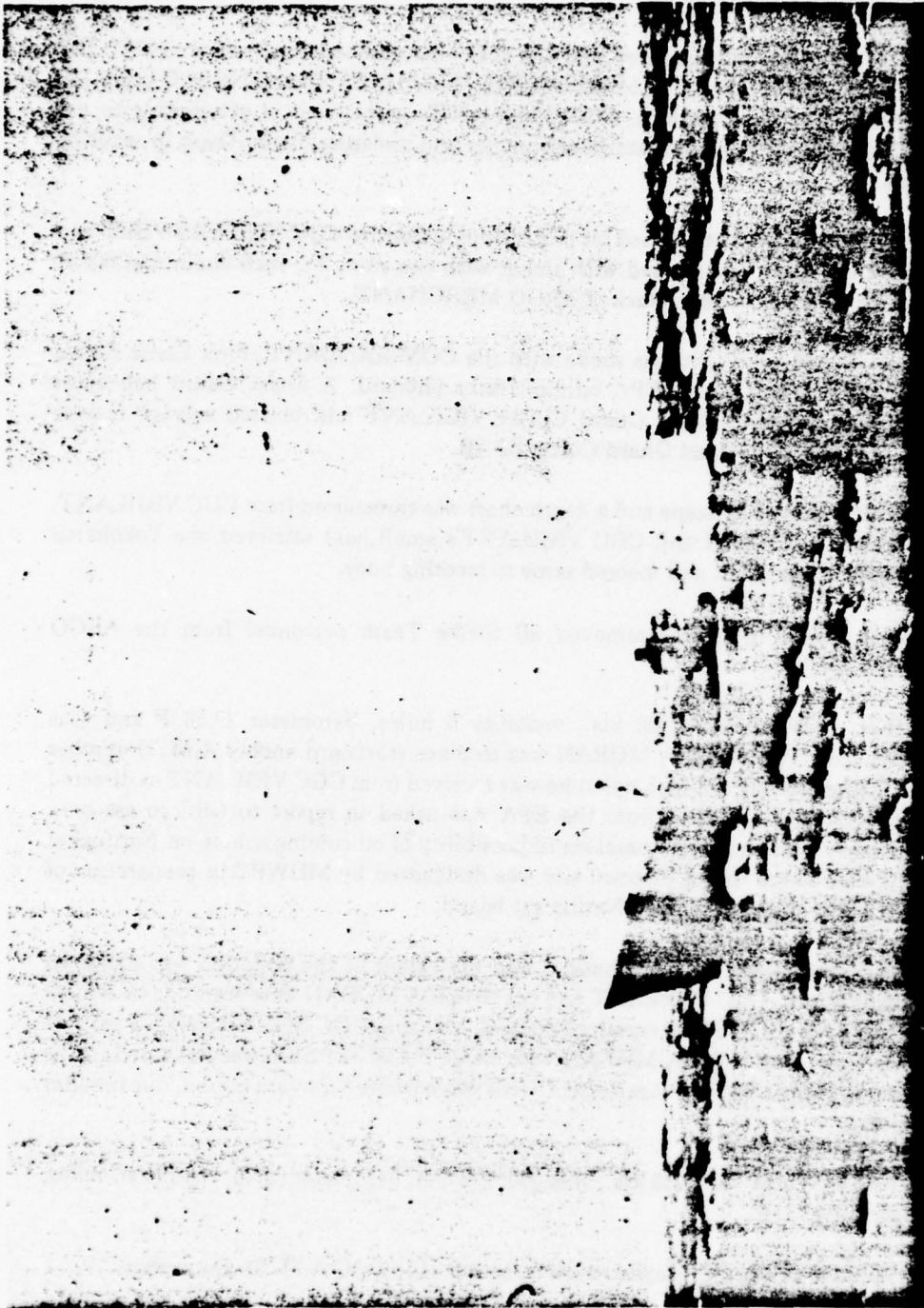


FIGURE 8 ARGO MERCHANT ON 20 DECEMBER 1976



FIGURE 9 ARGO MERCHANT ON 21 DECEMBER 1976

2234 Estimated rate of discharge of oil: 500 gallons per hour.

December 21, 1976

- 0008 Vessel's condition remained same, but heading changed to 238°T, and amount of oil being discharged had been greatly reduced. Slick tended 270°T. Bird situation report from the Commonwealth of Massachusetts indicated an unknown number of gulls and birds affected. (See Section 4-2 — Response Action for Wildlife Protection.)
- 0800
- Tug SHEILA MORAN released and departed enroute New York, due stores problems and no immediate need for towing assistance.
 - Weather — Winds 235°T/20 kts., visibility 3 miles, overcast, barometer 29.08 F, swells 235°T/6 feet. OSC recommended that no operations be performed aboard the ARGO MERCHANT this day.
 - Bow of ship pitching occasionally up to 10 feet. Present heading 258°T, stern section had sunk 2 to 3 feet, 02 deck astern was under water. A heavy Southwest swell sweeping vessel from bridge to stern, and Yokohama fenders washed up onto main deck. Spray was covering aft deckhouse. All mooring buoys intact; however, Yokohama fender previously tied to buoy missing. Position: 41°02.0'N, 69°27.5'W. Pollution consisted of thin brown layer 1/4-inch thick, extending 060°T, gradually breaking up into sheen. Conditions were unsuitable for boarding, except at bow and bridge (Figures 8 and 9).
- 0838 Ship split just aft of kingpost, 100 feet aft of bridge and the stern section sunk. Water level at 03 deck, 5-degree starboard list, heading 260°T. The bow section had reserve buoyancy forward and was either dragging along the bottom or still attached to the stern. Heading 025°T, forward section of bow 15-degree inclination from horizontal, 15-degree starboard list. A thin brown slick of oil was breaking up rapidly in the seas; some pancakes were evident.
- 0900 OSC made overflight with AST and Salvage Master.
- 1010 Bow and stern sections were grinding together; stern section appeared lower in water. Both lifeboats were missing from stern section. Water level runs from forecastle break starboard to bridge 02 deck starboard. Motion of the bow section was reduced to mild yaw and pitch, but showed no indication of floating free with existing sea conditions. Pollution appeared to have increased; considerable debris was streaming with slick 100°T from sections.
- Weather — Winds 270°T/30 kts., visibility 5 miles in mist, overcast, barometer 29.14, swells 200°T/8 feet.
- 1050 Tug SHEILA MORAN recalled and returned on scene; salvage vessel CURB was enroute scene.

- 1100 Weather — Winds 270°T/35 kts., swells 230°T/9 feet, barometer 29.15, visibility 8 miles, ceiling 2000 feet.
- 1126 For safety, during each scheduled radio broadcast the following message was relayed — U.S. Coast Guard Notice to Mariners, First District, Number 1686-76: Massachusetts Seacoast: "The tanker ARGO MERCHANT is aground and broken in two in position 41°02'N, 69°27'W. Vessel has a quick flashing white light on its foremast and is leaking oil. Mariners are advised to stand clear of this area."
- 1140 Condition of stern and bow sections remained unchanged. Wind and seas were driving bow section into the stern section. Stern section remained hard aground on heading 260°T; bow section heading was 045°T. Movement was detected on port anchor chain, indicating brake may have been holding.
- 1245 RRT requested to augment Brant Point with 1 office, 5-10 enlisted for beach patrols.
- 1310 OSC/U.S. Fish and Wildlife, and Massachusetts Department of Fish and Wildlife personnel established bird handling and cleaning stations at Nantucket, Martha's Vineyard, and Sandwich, Mass.
- 1358 Additional funds in the amount of \$500,000 were requested for salvage/response operation.
- 1510 U.S. Fish and Wildlife Service requested Federal funding for bird clean-up operations; request for an initial \$2,000 was approved.
- 1600 Met with Salvage Master, USN, AST and Secretary of Office of Environmental Affairs, Massachusetts, to determine best course of salvaging the vessel.
- 1710 OSC, CO AST, and Mass. Secretary of Environmental Affairs Murphy held press conference at Cape Cod.
- 1722 Investigations made concerning location where bow section of vessel could be towed to minimize adverse fisheries impact in the event disposal at sea became necessary. Information on effect of oil pollution on fishing ground in the vicinity of stranding, especially should oil sink to the bottom, was also requested.
- 1828 Beach patrols were instituted for Nantucket, Martha's Vineyard, and Cape Cod, and local service agencies (harbormasters, police, fire depts., etc.) were requested to assist in looking for oil coming onshore. Coastal Services and Jet Line Services were hired to deploy equipment to Nantucket Island contingency. Commonwealth of Massachusetts terminated contract with Coastal Services.
- 1846
- CGC EVERGREEN provided support to USCG R&D Center for underwater photo survey to determine oil pollution effect on fishing grounds. Port anchor streamed down side, seemed to be holding.
 - Concluded meeting with salvage master, USN, AST, and Secretary of Office of Environmental Affairs, Massachusetts, to determine best course of salvaging the vessel.

- Also consulting Naval Architect participated and was directed to draw up plan on how much oil to discharge to float bow section.

Alternate Plans for bow section were as follows:

1. Release entrapped air, sink hull in place, and recover oil at a later date under good weather conditions;
2. Offload sufficient oil to regain buoyancy, tow, and sink in deep water;
3. Remove all oil from bow section, inject air for buoyancy, tow to sea, and sink;
4. Remove partial cargo, inject air for buoyancy, tow to sheltered water, and offload cargo.

It was decided to proceed with Plan 2 as the fastest, most efficient and probably the least ecologically damaging plan. This plan would have to be delayed until the bow section was stabilized and workable. Weather was a large factor in these decisions and would have to be good to work on the vessel. This plan was to be implemented as follows:

- a. Test Pump #4 tank to cargo hold using ADAPTS pumps without heat.
- b. If successful, should float — tow to sea and dispose.
- c. If not successful, rig #4 for blow with air, seal tanks 1, 2 and 3. — Should float — tow to sea and sink.
- d. Modification to step C — remove oil #4 by heating and pumping to barge if weather permits rather than blowing overboard.

2100 Tug CURB returned to Woods Hole due to inoperative radar, but CGC VIGILANT and tug SHEILA MORAN were on scene. Tug MOIRA MORAN with barge NEW JERSEY were anchored in the vicinity of Nantucket Sound. Tug MARJORIE B. McALLISTER with barge NEPCO 140 was moored in New Bedford for fuel and stores.

December 22, 1976

0730 Condition of stern section was unchanged, but deck was awash by 3 feet (Figure 10). Bow section was still driving into stern section due to seas and wind. Bow was in same relative position, but had lost buoyancy and bridge house was totally under water. Forefoot was visible and only 100 feet of deck aft of forecastle break were above water. Unable to see any pollution due to spray and waves. Due to weather and probable icing aboard, it was recommended no operation be performed this day.

Weather — Winds 290°T/42 kts., visibility 10 miles, barometer 29.92 rising, air temperature 24°F, seas 295°T/15 feet.

0924 Condition of the vessel remained the same. Icing on wreck ¼-inch thick. Heavy concentration of oil near the tanker was estimated at 1.5 million gallons by joint CG/NOAA oil spill research team on basis of Coast Guard oil recon flight at 1030 21 December. Upon embarking the technicians, tug CURB returned to scene. AST and tug CURB planned to set starboard anchor to keep sections from working together, weather permitting.



FIGURE 10 ARGO MERCHANT ON 22 DECEMBER 1976 (EPA Photo)

- 1430 With wind and seas from 280°T and current setting toward 230°T, bow and stern sections did not appear to be grinding together. However, forward section may have settled lower in the water, as port anchor chain went slack. Pollution tended 230°T; moderate strength. CGC VIGILANT released tug SHEILA MORAN, tug MOIRA MORAN and tug MARJORIE B. McALLISTER from the incident per direction of the OSC. Two Coast Guard helicopters made a pollution overflight for drift analysis and oil samples were delivered to appropriate personnel.
- 1513 USN oil spill/salvage materials were shipped and staged at Coast Guard Air Station, Cape Cod.
- 1646 An aerial overflight of the wreck was authorized for various members of Congress and State officials on 23 December.
- 1830 OSC and CO AST attended Sen. Kennedy hearing in Boston. Also in attendance were Sen. Pell, Sen. Brooke, Congressman Studds, Sen. elect Chaffee, Congresswoman Heckler, and CCGDONE.
- 1847 Vessel remained at position 41°02.2'N, 69°27.5'W. Bow section was broken into two pieces just forward of forward deckhouse. Center section was not visible. Radar mast on forward house was approximately 3 feet below water in approximately 70 feet of water. Bow section had slid alongside the stern section and was driving into the stern and midship sections. Stern section remained at heading of 260°T with 5-degree list and deck submerged 3 feet. Aftershell plating was also torn and rolled back.
- Weather — winds 280°T/23 kts., seas 280°T/8 feet, visibility 10 miles, barometer 29.95 steady, air temperature 33°F.
- 1847 CGC EVERGREEN was enroute scene. Vessels CALICO JACK, SHEILA MORAN, MOIRA MORAN, MARJORIE B. McALLISTER, NEPCO 140 and NEW JERSEY were secured. Personnel and equipment from the Gulf Strike Team also secured. Woods Hole Oceanographic Institute R/V OCEANUS took surface, mid and bottom water samples, bottom grabs, and made optical transmissivity and temperature observations at three locations approximately 40 nautical miles Northeast of wreck on night of 21 December. No obvious oil found in bottom fauna. Samples still needed complete analysis.
- 2140
- CGC VIGILANT reported bow settling in at a 40-degree angle. Oil recon flight found oil extending from ARGO MERCHANT toward 100°T for 90 nautical miles. Heavy oil slick and moderate concentration found extending 12 miles East of the ship. Heavy pancake concentration found near the end of the slick.
 - Bird receiving station set-up in Nantucket. Nantucket divided into five areas with one man patrolling each section. Birds are being transferred to Martha's Vineyard for cleaning and handling. Eight MSO Boston personnel were at Brant Point to monitor contractors' activities and patrol beaches.

December 23, 1976

- 0500 Tug CURB was on-scene and preparing to remove mooring buoys.

- 0622 CGC EVERGREEN was at the first oceanographic sampling site and completed sampling in Area B. Position 40°51'N, 69°40'W. Data collected included two rolls of underwater photos, three bottom samples, and four water samples. Water and bottom both appeared clean.
- 0805 Close observation showed stern and bow sections unchanged. Bow was inclined 40 degrees above horizontal (Figure 11). Four mooring buoys were in place. No sign of either Yokohama fenders. Swells were putting seas and spray up to stack and fore-castle break. Pollution tended 045°T and consisted of irregularly shaped black patches of heavy oil 2 inches thick, plus areas of brown thin 1/4-inch surface oil and a wide plume of sheen. Significant part of oil was coming from stern section.
- 1040 A Coast Guard helicopter was enroute the scene to deliver three Strike Team members.
- OSC, EPA rep met with Mr. Tully of TULCO INC. discussed means of delivery of wicking agent and means of ignition.
- 1100 CGC EVERGREEN reported the surface water almost 100% covered with oil sheen with heavy concentrations of slicks, oil clumps, and tar balls. In all water samples, oil droplets were visible and suspended in water. Bottom samples at 70 meters were apparently free of oil, however. Few birds were observed. Combination of surface sheen and bright overcast limited observation of heavy oil concentration to close alongside wreck. However, some organization of heavy oil into wind-aligned strings was observed.
- 1210 CGC VIGILANT's small boat returned to the CGC VIGILANT after having conducted diving operation with Navy divers.
- 1300 CGC VIGILANT was standing in close vicinity of wreck, and salvage vessel CURB was retrieving mooring buoys previously placed by CGC SPAR and CGC BITTER-SWEET. CGC EVERGREEN and R/V DELAWARE II were conducting independent operations in the general area. Pollution was unchanged, except that it was tending easterly from the ARGO MERCHANT.
- 1500 MSO personnel were on-scene Nantucket Island conducting beach surveys in two vehicles. No pollution was sighted. A request that gunfire from the CGC VIGILANT be utilized to release entrapped air from the bow section was denied by the District Commander. OSC rep met with Jet Lines, Coastal Services, Massachusetts Fish and Wildlife, and U.S. Fish and Wildlife personnel. Only 14 oily birds had been handled after extensive beach surveys by all agencies involved. FWS personnel required no additional Coast Guard assistance.
- 1518 CGC BITTERSWEET was requested to temporarily establish Fishing Rip lighted gong buoy, a 9 x 32 LGR painted red and black, horizontally banded, showing an interrupted quick-flashing white light, easterly of ARGO MERCHANT.
- 1554 NMFS agents were canvassing fishing vessel (F/V) landings in the area. Approximately 100 F/V were to be contacted each day and debriefed as to oil observed on surface, bottom, and on fish and birds.

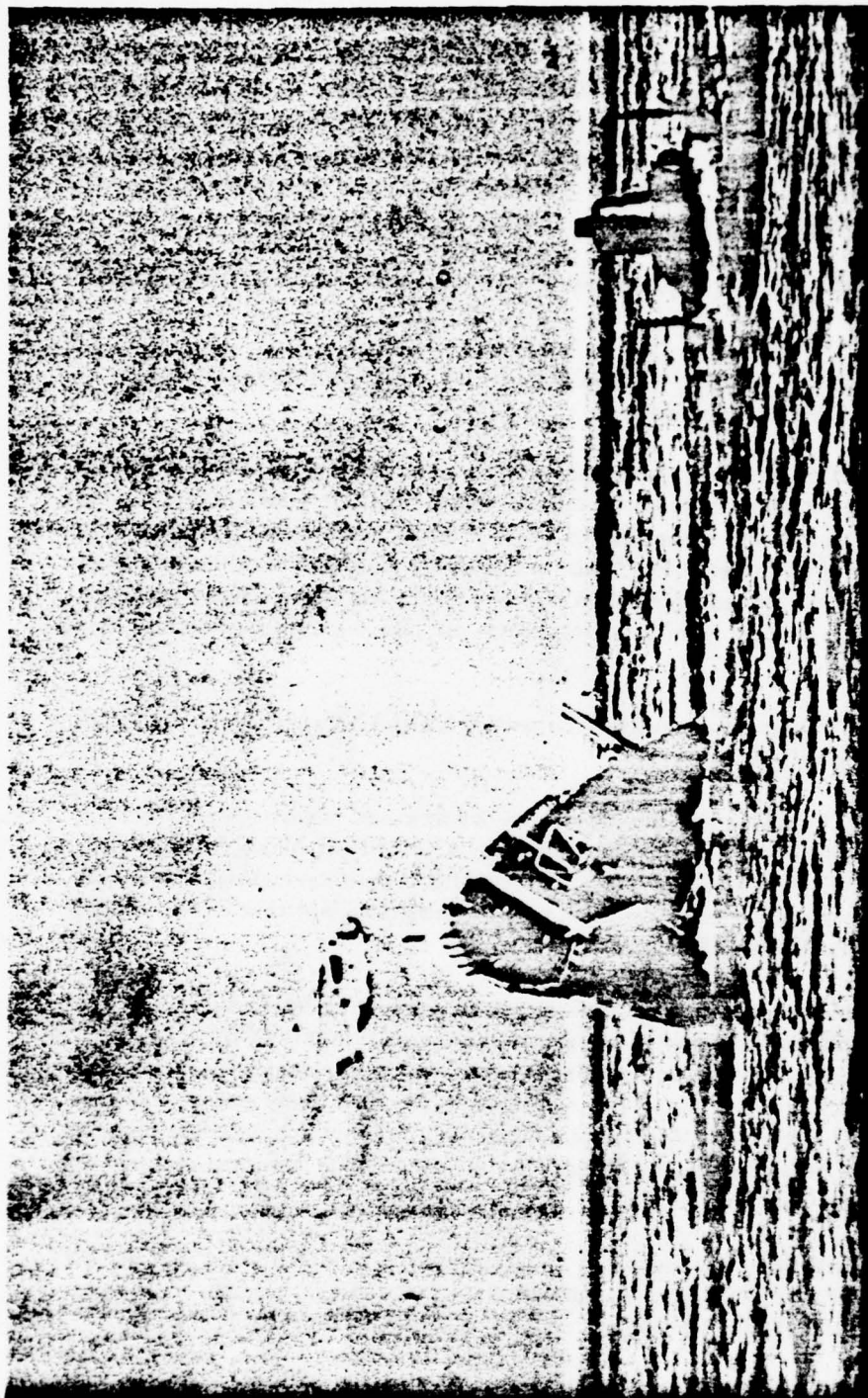


FIGURE 11 ARGO MERCHANT ON 23 DECEMBER 1976

1600 CGC EVERGREEN reported visible surface water was 20% covered with sheen in heaviest areas. Water samples at depths of 1, 5 and 10 meters contained some oil droplets. None detected at 20 meters. No oil in bottom samples at 60 meters.

Weather — Winds 225°T/5 kts., seas 225°T/3 feet, barometer 29.85, sea temperature 8.3°C, air temperature 8.0°C, visibility 10 miles.

- 1717
- Bow section still believed to be hinged to mid section. Bow section had settled approximately 20 feet and was slowly losing buoyancy. As determined by calculation, there was no possibility of towing. Oil continued to flow at 100 gallons per hour. Unable to determine origin of leaking due to seas and attitude of the vessel.
 - Weather (1355) — Winds 200°T/12 kts., seas 145°T/1 foot, visibility 10 miles, barometer 29.76, temperature 45°F.
 - AST searched vessel for oil, opened forepeak hatch forward of anchor windlass, and 14-inch Butterworth tank cleaning opening. Opened port side door leading to forecastle, and cofferdam doors forward of NR 1 tanks. No oil was observed in any of these spaces. Bow section of ARGO showed little sign of further settling and was expected to remain upright.
 - CBC VIGILANT was notified that shell fire to stabilize the ARGO MERCHANT was not authorized by CCGDONE.
 - Expenditures to-date were \$624,000.
 - CGC VIGILANT conducted diving operations in the vicinity of the ARGO MERCHANT to 140 feet depth and no oil was found on the bottom.
 - Tug CURB was to return onscene 24 December to retrieve mooring buoys. Daily observation flights were continued by Coast Guard.

December 24, 1976

0420 Weather — Winds 315°T/27 kts., seas 310°T/4 feet, air temperature 2.0°C, barometer 29.86, visibility 10 miles. A request was made to provide air transportation for a U.S. Senator and one press member on 24 December for observation of planned experiment to burn floating oil.

0730 Bow and stern sections appeared unchanged. Stern sunk heading 260°T, 03 deck awash, bow inclined 40 degrees off horizontal, 15-degree starboard list, heading 045°T, waterline unchanged. Waterline runs from forefoot to point 50 feet aft forecastle break on port side to point at forecastle break on starboard side. Pollution tends 230°T and consists of very small pieces of sheen. Volume of discharge greatly reduced and possibly due to very slight sea action on wreck at present.

1030 Conducted initial lab test of wicking agent at Otis AFB Fire Department test site. Wicking agents provided by Tulco Inc. U.S. Army Explosive Ordinance Demolition

Team (EODT) provided timer fuse and thermite grenade for initial start. Test was to determine safety for air delivery. Tulco reported it needed at least 10-foot diameter and 1/4-foot thick slick for the test.

- 1218 Tug CURB retrieved one mooring.
- 1318 A large percentage of gulls in the vicinity of the wreck were oiled. Three finback whales were sighted, but were apparently not bothered by the pollution area. (Note: Whales avoided area of pollution.)
- 1323 Observation aircraft with Senator Pell aboard, enroute to view floating oil-burning experiment, and a Coast Guard helicopter was enroute with incendiary equipment and personnel. Mission could not be completed due to lack of oil patches of sufficient size to conduct the experiment.
- 1645 Tug CURB stopped work this date. Two moorings remained in the water.
- 1825 CGC VIGILANT reported very small amount of pollution sighted.

December 25, 1976

- 0740 Condition and position of stern and bow sections remained unchanged. Ullage openings of NR1 port and NR2 port were closed. All water-tight doors appeared closed, except the port water-tight door to the forecabin between decks which was ajar.
- 1102 CGC VIGILANT had taken 10 water samples for NOAA to date. Estimated cost to date was \$667,000.
- 1645 A Coast Guard helicopter located a large pool of oil at 40°54.0'N, 68°38.1'W and vectored CGC VIGILANT to its location. Bird life was sighted, including approximately 100 gulls, mixed herring, and blackback gulls within 200 yards of a slick and they were 60% oiled. No dead birds were sighted.
- 1809
- Weather — Winds 234°T/18 kts., seas 235°T/2 feet, visibility 10 miles, air temperature 47°F, sea temperature 40°F, barometer 29.95 falling.
 - Dr. Milgram of Massachusetts Institute of Technology analyzed samples of oil for the USCG R&D Center and reported that the oil could not sink unless it adhered to sediment. Due to onshore wind forecasts, Coastal Services and Jet Line Services were placed in a higher state of readiness, and Cannon Engineering was hired to stand by in Chatham area. U.S. Army transportation personnel and Skycrane crews were also recalled.
 - Salvage vessel CURB departed scene enroute Staten Island, New York, after retrieving remaining two moorings.
- 2030
- Weather — Winds 250°T/12 kts., visibility 10 miles, barometer 29.90 falling, air temperature 46°F falling, seas 240°T/3 feet.

- CGC VIGILANT reported bow and stern sections were unchanged, and pollution was undetected due to darkness. Estimated cost of response: \$707,000.
- Observation flight found oil moving in general 110°T direction, 55 miles wide, and S-shaped. Eastern extent of oil was not fully determined, but extended at least 85 miles. Made current measurements. Large oil slick reported by CGC VIGILANT. Some 8000 drift cards were being flown to Logan Airport for deployment inshore and in slick.

December 26, 1976

- 0800 Pollution slick tended 250°T from ARGO MERCHANT 200 yards wide. Consisted of thin brown oil breaking mostly into sheen within one mile. Few widely scattered pieces of thick black oil or tar balls less than 6 inches in diameter were observed within 1000 yards. CGC VIGILANT continued to obtain water samples.
- 1010 3,000 drift cards were deployed at three locations West of the wreck to aid in oil drift predictions and for early warning. Cards were preprinted with a phone number which finders of the cards were requested to contact.
- 1855
- Cannon Engineering was in the process of stationing two spill trailers at the Chatham Fish Pier and one in the Orleans area. Massachusetts Division of Water Pollution Control was providing liaison with Cannon Engineering and local harbor-masters from Nauset Harbor to the Swan Pond area. Some 55 birds had been picked up on Nantucket Island; 23 birds were transported to Felix Neck Wildlife Sanctuary, and 156 had been cleaned and were surviving; 30 birds to date had been found dead.
 - U.S. Army resources were as follows: 104th Transportation Co., 9 members; 355th Transportation Co., 8 Skycrane crew members; 14th EOD Team was on immediate standby at Ft. Devens, Mass.
- 1930 OSC requested CCGDONE make a WMEC available for relief of the CGC VIGILANT as scheduled.
- 1959 MSO Boston verbally requested authority to establish security zone on site to keep civilian divers and salvagers away. Onus of responsibility if civilian divers and salvagers should cause a release of trapped oil from the wreck was also requested.
- Note:*
- The Intervention Act (Appendix I) in force for subject spill, provided authority to set up reasonable security zone and prohibit any unauthorized persons from entering this zone. Act provides for criminal penalties of \$10,000 fine, imprisonment for one year, or both for any person who willfully refuses or fails to comply with order or direction issued pursuant to the Intervention Act.
- 2000 Weather — Winds 315°T/40 kts., visibility 5 miles, overcast, barometer 29.11 steady, air temperature 37°F falling, seas 330°T/5 feet.

- 2015 Bow and stern sections were unchanged. Pollution was undetectable due to darkness.
- 2208 CCGDONE was unable to provide WMEC relief due to scheduling requirements as per Commander, Atlantic Area, USCG quarterly employment schedule for First District WMECs. CGC VIGILANT's present patrol was due to end 28 December. It was considered necessary to maintain onscene Coast Guard surveillance for pollution sightings, sampling programs, and to maintain Coast Guard control of response action.

December 27, 1976

- 0800 • Federal and State agencies were continuing attempts to collect and treat oil-covered birds.
- Stern section remained unchanged, with 03 deck awash. Bow section had laid over to starboard and sunk approximately 10 feet. Tilt to starboard was 40 degrees; keel laid 50 degrees above horizontal. Waterline ran from 10 feet astern of forefoot to 35 feet aft of forecastle break, port side, to 6 feet forward forecastle break, port side. Occasionally bow section moved as much as 3 feet with the seas. Due to 60-degree inclination of deck, any operations aboard were considered extremely dangerous. Pollution sheen tended 270°T, breaking-up within one-half mile due to sea action.
- 0850 Wildlife observation in the vicinity of the tanker noted that the percentage of oiled birds was much lower than before the storm.
- 1325 CGC BITTERSWEET was directed to proceed and relieve CGC VIGILANT as Coast Guard surveillance vessel on 28 December. Upon relief, CGC VIGILANT was ordered to return to home port and assume regular schedule.
- 1400 Stern section remained unchanged. Bow section rotated 90 degrees, so that deck now faced Southeast vice Southwest (Figure 12). Patches of heavy black oil 1 to 10 feet wide were coming from the wrecked vessel.
- 1905 A Coast Guard helicopter completed first burn tests. Videotape of test was returned to Boston. Coast Guard C-130 arrived Coast Guard Air Station with Lockheed skimmer gear and two AST personnel. Plans for offshore skimming operation were not put in operation due to slick location. No firm contracts were made for barges and tug to be used in connection with offshore skimming operation.
- 2153 Vessel remained at position 40°02.2'N, 69°27.5'W. Stern section heading was 260°T with 5-degree list and sunk to 03 deck. Center section remained sunk, and bow section was working in the seas. Bow had laid over starboard to 40 degrees, keel 60 degrees above horizontal, and had rotated 90 degrees, and decks were facing Southeast vice Southwest. Waterline ran from 10 feet astern of forefoot to 35 feet aft of forecastle break on port side to 6 feet forward of forecastle break on starboard side. Occasionally bow section moved as much as 3 feet with seas.



FIGURE 12 ARGO MERCHANT ON 27 DECEMBER 1976

- 2153 Vessel remained at position 40°02.2'N, 69°27.5'W. Stern section heading was 260°T with 5-degree list and sunk to 03 deck. Center section remained sunk, and bow section was working in the seas. Bow had laid over starboard to 40 degrees, keel 60 degrees above horizontal, and had rotated 90 degrees, and decks were facing Southeast vice Southwest. Waterline ran from 10 feet astern of forefoot to 35 feet aft of forecastle break on port side to 6 feet forward of forecastle break on starboard side. Occasionally bow section moved as much as 3 feet with seas.
- 2200 Examination with search light revealed bow section turned over and sunk. Unable to determine details due to heavy weather; however, 50 feet of bottom and 10 feet of stem remained above the water. Pollution not observed due to darkness. Figures 13 and 14 provide a view of wreck taken on 27 December.
- 2300 Weather — Winds 265°T/35 kts., seas 280°T/8 feet, barometer 29.49, visibility 10 miles, air temperature 35°F.

December 28, 1976

- 0615 Weather — Winds 295°T/7 kts., seas 305°T/02, barometer 29.58, visibility 2 miles with snow, air temperature 28°F.
- 0845 Wildlife observation in vicinity of spill site reported.
- | Type Bird | No. | Percent Oiled |
|-----------------|-----|---------------|
| Blackback Gulls | 45 | 15 |
| Herring Gulls | 50 | 20 |
- 0937 Burning experiments were to be continued under the auspices of CG R&D Center and EPA observer.
- 1000 A press conference at CGAS Cape Cod was held with OSC, NOAA, USN, AST, CG OCEANO UNIT, EPA participating to bring all media up to date on all aspects of response and future plans.
- 1520 CGC BITTERSWEET relieved CGC VIGILANT as onscene support vessel; CGC VIGILANT returned to New Bedford, Mass.
- 1555 Establishment of security zone requested by message, from position 41°03'N, 69°27'W and the area within a 5-mile radius therefrom. CGC BITTERSWEET was to enforce security zone for OSC, with all vessels required to have permission to enter the area from OSC via CGC BITTERSWEET.
- 1600 Weather — Winds 060°T/15 kts., visibility 13 miles, sky overcast, temperature 35°F, seas 060°T/2 feet, swells 090°T/2 feet.
- 1730 CGC BITTERSWEET reported condition of wreck remained unchanged.
- 1804 CGC BITTERSWEET established Fishing Rip lighted gong buoy in 50 feet in position 41°02.5'N, 69°26.8'W approximately 290 yards 072°T from wreck.

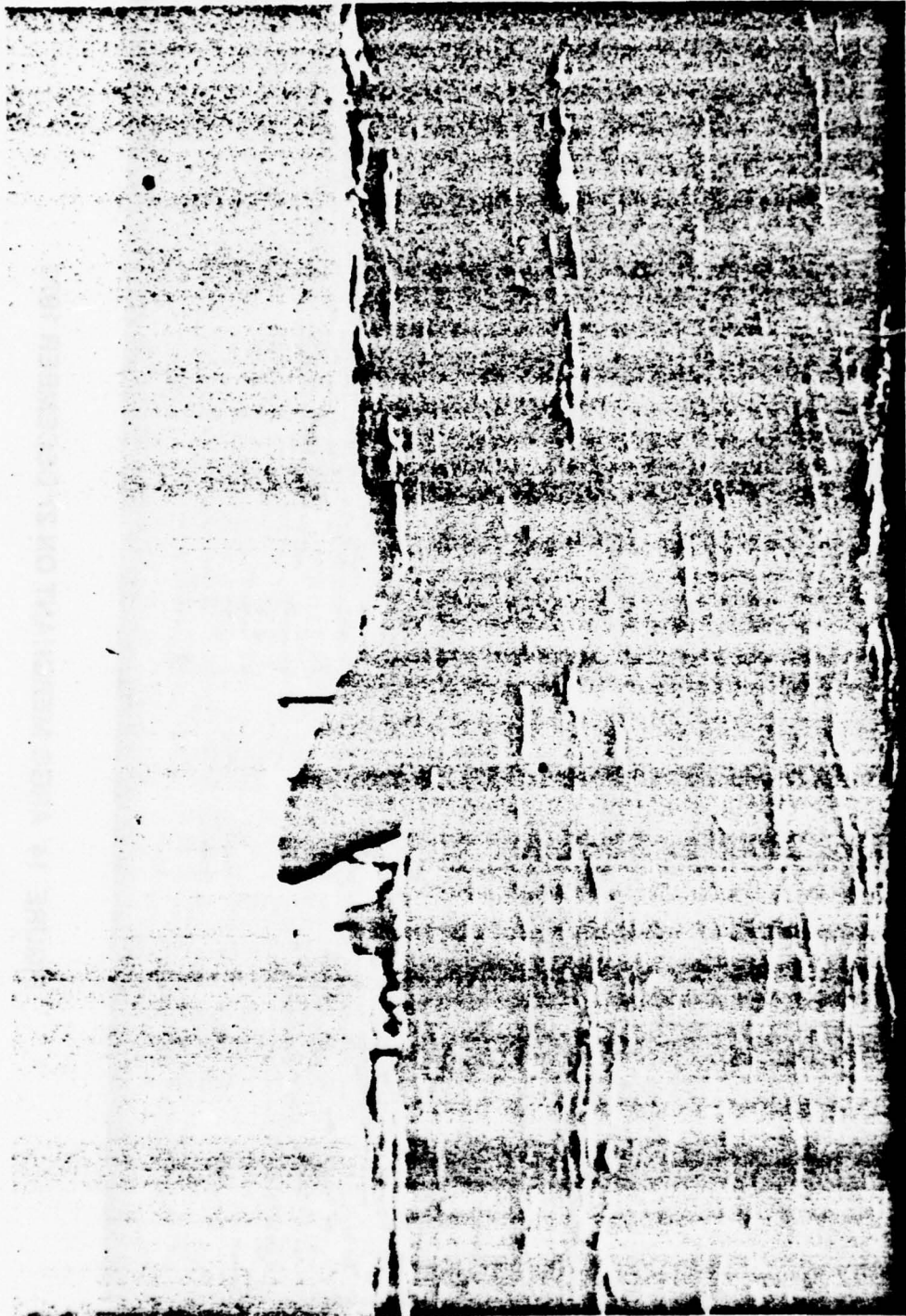


FIGURE 13 ARGO MERCHANT ON 27 DECEMBER 1976



FIGURE 14 ARGO MERCHANT ON 27 DECEMBER 1976

- 1826 Per Commandant: "In view of inconclusive results from earlier burning tests, more definitive tests from a vessel platform were deemed appropriate and necessary. These additional tests were to be conducted on existing oil slick. An accurate estimate of the amount of oil consumed during the test was requested. An estimate of the ratio of wicking agent and catalytic fuel consumed to pollutant burned was also requested."
- 2310 Some of the spill clean-up standby equipment on Nantucket was released due to oil offshore movement and proven reliability of forecasted oil limits.

December 29, 1976

- 0700 Weather — Wind 110°T/25 kts., seas 110°T/3 feet, swells 060°/5 feet, temperature 43°F, visibility 10 miles, sky overcast with rain, ceiling broken, clouds 500 feet, overcast 1000 feet.
- 0755 Bow and stern sections remained unchanged. Pollution consisted of light sheen trending 200°T at 1800 yards from vessel. Pollution was beginning to dissipate. Slick appeared to be about 3 to 4 miles by 500 yards with no pancakes.
- 0850 Army EODT, CGC SPAR, CG R&D rep, and 20 boxes of "Tullanox" wicking agent scheduled for burn test for 30 December. CGC BITTERSWEET requested to increase water sampling to 20 per day.
- 1007 CGC SPAR was directed to proceed to Woods Hole by CGDONE for onloading necessary equipment and personnel for burn demonstration.
- 1240 U.S. Coast Guard Notice to Mariners, First District, Number 1723-76, Massachusetts Seacoast, established a prohibited zone for the area within 1000 yards radius of the wreck, approximate position 41°02.2'N, 69°27.5'W, pursuant to the Intervention Act.
- 1300 CGC SPAR placed under the OPCODE of OSC.
- 1335 Weather — Wind had shifted 180 degrees to 290°T and increased to 30 knots, seas became confused, and slick was no longer visible.
- 1400 At 1400 CGC BITTERSWEET proceeded on northwesterly heading toward Nantucket for 10 miles; at 1610 numerous 6-inch diameter brownish black pancakes of oil 315°T were observed 8000 yards from wreck.
- 1600 Weather — Wind 257°T/30 kts., seas 380°T/4 feet, swells 310°T/6 feet, temperature 32°F, overcast ceiling, 5,000 feet, seas building rapidly.

Following wildlife observed during the day.

Type Bird	No.	Percent Oiled
Herring Gull	29	35
Blackback Gull	20	40
Kittiwake	08	25

- 1900 Weather worsening, wind 280°T/35 kts., and gusting, seas 300°T/6 feet, temperature 31°F, visibility 6 miles.
- 1959 CGC DALLAS was requested to conduct XBT transect in the vicinity of 39°N, 70°W to 40°N, 67°W and then to 40°N, 66°W avoiding heavy concentrations of oil. XBT spacing was to be approximately 20 miles.
- 2221 MSO Boston requested Coast Guard Air Station, Cape Cod, to have an aircraft available to take off at 0900 to locate 10 feet or larger diameter pancake and notify CGC SPAR and Coast Guard Air Station of position; also to provide aircraft to arrive at position, remain onscene, and videotape burn experiment.
- 2255 CGC SPAR was underway with equipment and passengers enroute lee of Nantucket Island to await favorable weather for conducting burn test. Stern and bow sections remained unchanged. Pollution observed at 1400 consisted of scattered brown patches 4 miles Northwest of the vessel. Further sightings were not possible due to the weather.

Mr. Paul Tully, CDR. Rybacki, USCG, and Mr. Robert Richards, USCG R&D, were to be on board the CGC SPAR during the burn test scheduled for 30 December. R/V DELAWARE II, ENDEAVOR, WHITEFOOT, and OCEANUS had OSC permission to operate within the prohibited zone. Coastal Services removed some unnecessary equipment off Nantucket Island.

December 30, 1976

- 0100 Weather — Wind 280°T/40 kts., seas 270°T/4 feet, swells 080°T/2 feet, temperature 32°F, visibility 7 miles, ceiling 500 feet.
- 0700 Weather — Wind 280°T/35-40 kts., seas 270°T/4 feet, swells 280°T/15 feet, temperature 29°F, ceiling 1000 feet overcast.
- 0800 Plans made to have CGC SPAR on slick first light on 31 December to attempt burn test.
- 0950
- Permission requested, but denied to release air entrapped in bow by gunfire.
 - Request resubmitted with following amplifying information:
Bow section aspect had since changed in that it was now capsized with approximately 35 feet of stem and 30 feet of keel out of the water. This section was hard aground on sloping bottom, but believed to have some buoyancy forward due to trapped air in empty tanks and forepeak. Some oil believed to remain in tanks 1C, 2P, 2C, and 2S which were noted as breached during last observation aboard. Oil also believed trapped in various pockets in vessel, even though most other areas believed open to the sea. Bow section reported to be moving slightly under force of wave action. Forepeak tank, dry cargo hold, cofferdams, and 1P and 1S tanks free of oil. Best information available indicated forward deep tanks were free of oil. Plan was to maintain surveillance by surface vessel until bow section stabilized to monitor oil leakage, to determine if the bow section continued to work under wave

action and maintain prohibited zone. After the bow stabilized, weather permitting, intent was to conduct diving survey to determine the amount of oil remaining aboard. Diving operations were considered too hazardous without bow stabilized. It was also possible that the bow section might remain in its present condition for a lengthy time. Use of gunfire to release trapped air strongly urged by OSC.

- 1439 OSC, requested daily observation flights to determine extent and drift of spill be continued for at least three weeks. Flights will be of six to eight hours duration.
- 1449 OSC was authorized to fire 20 mm (APT) non-explosive projectile into ARGO MERCHANT forepeak tank to puncture skin and release entrapped air, but not to fire into deep tanks.
- 1520 Weather — Winds 280°T/40-45 kts., seas 270°T/4 feet, swells 280°T/12 feet, temperature 29°F, ceiling 2000 feet broken, visibility 7 miles, barometer 29.67.
- 1740
- Weather — Winds 270°T/60 knots, seas 270°T/20 feet, barometer 29.59 falling, visibility 1 mile, sea temperature 56°F.
 - Conducted H3 overflight with the following onscene conditions noted: Bow section had moved 400-500 yards to Southeast of stern section. Bow heading approximately 130°T. Bow and stern sections were both leaking oil. Slicks 70 yards apart were converging into one slick approximately ½ mile downwind (DW). Converged slick was approximately 200 yards wide. Slick 1 mile DW consisted of 2 percent sheen. Beyond mile no pancakes observed, after 6 miles 10 percent sheen, and after 7 miles DW, no pollution observed. Pancakes observed 2-3 feet diameter.
 - CGC BITTERSWEET and CGC SPAR sought shelter lee of Nantucket Island awaiting favorable weather conditions. Projected forecast projections for the next 3-4 days indicated that offshore winds would dominate.
 - CGC BITTERSWEET was directed to proceed daylight 31 December to onscene and release entrapped air in bow section by 20 mm (APT) gunfire.
 - Announced plan to launch BTT satellite-tracked buoy in large slick located on 27 December.

December 31, 1976

- 0500 Weather — Winds 350°T/8 kts., seas 280°T/2 feet, swells 280°T/5 feet, air temperature 30°F, visibility 3 miles and snowing.
- 0900 Secretary DOT, Vice COMDT, EPA Administrator, and CCGDONE arrived at Coast Guard Air Station, Cape Cod, for briefing by OSC, overflying wreck site enroute.
- 0945 Secretary of Transportation Coleman held press conference at CGAS Cape Cod following briefing..
- 1132 CGC BITTERSWEET commenced firing on the bow section of ARGO MERCHANT.

- 1236 Firing terminated with 520 rounds of 20 mm ammo having been expended. Estimated 30% hits, with misses attributed primarily to rolling of ship and ricochets. Most hits were on port side forward. Bow section settled noticeably with about 10 feet remaining above the surface. Kingpost and aft section of bow believed to be resting on the bottom. During firing brown stain was sighted. Leaking was intermittent, but ceased. Draft readings were 26 feet when firing commenced and 21 feet when firing was secured and bow settled. Heading of bow section was 210°T and appeared to be stable.
- 1453 A Coast Guard helicopter was enroute to position 40°11'N, 67°01'W to drop BTT satellite-tracked buoy.
- 1538 CGC SPAR commenced burn test, which was deemed unsuccessful for the following reasons: (1) unable to disperse wicking agent without excessive loss (approximately 90%); (2) unable to maintain continuity of slick due to vessel propulsion turbulence; and (3) unable to sustain initial burn. Expended 220 pounds of wicking agent and 55 gallons of JP-4 aircraft fuel igniter.
- 1605
- Bow section appeared to be on Southwest edge of 27-foot spot shown on CGC VIGILANT sounding sheet. Bow had settled 2 to 3 feet since last report, and seas were breaking completely over bottom frequently. Heading remained 210°T.
 - Weather — Winds 280°T/20 kts., seas 310°T/2 feet, and building, swells 280°T/6 feet, air temperature 28°F, clouds breaking, visibility 8 miles.
- 1700 Coast Guard H3 helicopter placed a NASA-tracked BTT buoy in large oil pancake in position 40°20'N, 67°01'W. Buoy had LOA of 10 feet, width 2 feet, and had 3 feet showing above waterline.
- 1915 CGC SPAR received permission to change operational control to CCGDONE and proceed to Portland.
- 1918 CGC BITTERSWEET was released from monitoring and proceeded to home port. Air Station, Cape Cod, was requested to provide H-3 overflight daily to monitor the bow section, weather permitting.
- 1947
- Weather — Winds 335°T/15 kts., seas 335°T/4 feet, visibility 7 miles, temperature 28°F.
 - Bird cleaning and handling count as of 31 December: Nantucket has processed 109, 62 DOA, 47 alive and transferred to Felix Neck Center, Martha's Vineyard. Plan to survey hull with AST divers to determine amount of oil left in vessel. Due to bow section having moved to the Southwest 400-500 yards, request made to have prohibited zone's radius increased to 1 mile and buoy relocated 115°T 750 yards from present position.
- 2204 The U.S. Geological Survey, Woods Hole, established current meters and bottom monitoring instrumentation.

January 1, 1977

- 0801 Before departing the scene on 31 December, CGC BITTERSWEET reported bow had settled another 2 to 3 feet.
- 1845
- Three different attempts were made to overfly the bow section, but flights were cancelled due to bad weather and SAR commitments.
 - Local Weather — 1745R Winds 340°T/10 kts., seas 030°T/2 feet, barometer 29.54 rising, visibility 14 miles, temperature 21°F.
 - Bird cleaning and handling totals: as of 1 January: 131 delivered Nantucket, 78 DOA, 53 alive.

January 2, 1977

- 0635 Received position of BTT buoy via NOAA, position 39°49'N, 66°30'W at 1207R. Travelling 145°T, speed 1.6 knots. National Aeronautics and Space Administration (NASA) scheduled to overfly area to do research project in conjunction with NOAA.
- 1000 Plans made to attempt diving operation by AST members to determine the amount of oil remaining on the vessel, weather permitting.
- 1005 A request was made for 180-foot buoy tender for AST diving platform on 3 January.
- 1205 Overflight showed that the stern section was listing approximately 30 degrees starboard (change from last report of 15 degrees starboard) and emitting light sheen. Bow section was still 400-500 yards Southeast of stern. Wreck buoy was approximately one-half way between sections with approximately 5 feet showing above the water. Wreck was emanating heavy sheen with small blobs of oil near vessel. Blobs were 1-2 feet in diameter. Water was spraying from holes in hull on surge of waves. Unable to determine if this was caused by working of hull or wave actions within hull.
- 1918 Station Chatham was requested to conduct vehicle patrols from Nauset Harbor South to Dennisport and boat patrols east side of Monomoy Island, weather permitting, and report daily findings to OSC, Cape Cod.
- 2021 Received water column samples and sampling equipment from CGC BITTERSWEET; two samples were retained by MSO. Other samples and equipment were transferred to NOAA. Oil survey flight reported oil tending 180 nm, 120°T from site with concentrations 50 nm in diameter located near miles 90 and 155. Concentrations and wreck site connected by isthmuses less than 20 nm wide. Oil coverage was less than 1 percent or less, except near mile 170 where concentration was 2 percent. Pancake size less than 10 feet diameter except near mile 170 where 50-foot diameter pancakes seen. Concentration near mile 155 appeared entrained in offshore flow on Northeast side of eddy centered near 39°35'N, 67°20'W.

January 3, 1977

0800 Fishing Rip Weather — Winds 335°T/10-15 kts., seas 335°T/2-4 feet, visibility 10 miles.

Plan made to discuss plans and criteria with scientific personnel for continued tracking of oil, threat probabilities and timing of actions with these probabilities.

1016 180-foot buoy tender was not available, but patrol boat (WPB) could be provided for diving platform.

1527 Message from COMDT USCG, Washington, D.C., and CCGDONE: "The loss of the ARGO MERCHANT and its cargo has resulted in unprecedented nationwide focus on an ongoing Coast Guard operational incident. Throughout the past two weeks personnel of your command, assisted by Atlantic Strike Force personnel, have struggled valiantly against the adverse elements to avert the loss that has occurred. These efforts have involved long working days and extended absences from home under arduous and frequently dangerous conditions during the holiday period when each of us hopes to be with our loved ones. I am proud of the professional and dedicated performance of all Coast Guard forces during this trying period. Please pass my compliments to all personnel on a task being well done and my regrets for the personal inconveniences to them and their families during the holidays."

1606 Air Station, Cape Cod, HU16E aircraft inventory considered grounded until source of aviation fuel could be found and made available for future operations. Phone conversation with COMDT confirmed belief that 100 low lead fuel was not acceptable for HUI6E use on either temporary or permanent basis. Survey flights could not be accomplished due to fuel problems.

- 1808
- Overflights provided locations of bow and stern sections in position 41°02'N, 69°27.3'W and ship heading was 120°T. Bow heading was 295°T, keel up, 3 feet showing, stern section heading 280° magnetic.
 - Seas 335°T/3 feet, winds 335°T/12 kts. Flight found oil tending 5 miles Northwest of wreck and about the same as previous day's flight Southeast of wreck.
 - Bird Situation: U.S. Fish and Wildlife released personnel from Nantucket and Martha's Vineyard. OSC ceased Federal Funds this date. Bird processing status as follows: Totals: 62 alive, 95 dead. OSC funding level: Massachusetts \$10,000, U.S. Fish and Wildlife \$2,000.
 - Tug WHITEFOOT was hired for diving platform to provide assistance for diving operations scheduled for 5 January, due to WPB SAR commitments and its unsuitability as diving platform.
 - Dropped additional 1000 drift cards in position 41°04.5'N, 69°34'W. Oil concentration was heaviest in eddy-centered position of 39°30'N, 66°30'W.

- NASA research flight was conducted.
- U.S. Army complement was released; moving equipment to Fort Devens.
- Cannon Engineering was released from Chatham area due to projected wind and oil drift time forecasts. Daily patrols were being conducted by USCG Chatham Station.

January 4, 1977

0900 Two personnel released from MSO response team from Nantucket; one officer and two enlisted men remaining at Nantucket. A helicopter overflight of the bow section and the monitoring of pollution planned. A 5-gallon sample also requested.

0930 CCGDONE was requested to make available a suitable aircraft (A/C) to OSC to conduct mapping flights due to unavailability of HU16E. Flights were to be scheduled every other day. Also Coast Guard Air Station, Cape Cod, was requested to make available an H3 helicopter to conduct mapping flights to limits of A/C range until other suitable A/C could be provided. Flights were to be scheduled every other day.

1055 • USCG Air Station, Cape Cod, A/C on SAR operations reported sheen with some blobs in area bounded by:

40°51'N, 70°23'W

40°42'N, 70°00'W

40°51'N, 69°45'W

40°47'N, 70°15'W

40°13'N, 70°05'W

Larger oil blobs were reported at 40°35'N, 69°56'W.

- CGC DALLAS was directed to the scene to obtain samples of oil and report findings to OSC.
- 1345 Based on assumptions that oil would leach from bow, stern, and midship sections for lengthy period of time, and that oil previously released might remain in the area 70-140 miles Southeast of wreck for a period of time, RRT was requested to meet to consider the following points and advise:
- Whether oil should be tracked more than 200 miles from wreck or more than 100-fathom curve. If oil reaches this point, should it still be considered a threat?
 - USN hot-tap method of oil recovery entails 21 working days of good weather and an estimated \$500,000 expenditure. Probably commence operations in May or June 1977. This was considered an optimistic estimate by OSC, considering currents and distance offshore of wreck. Need guidance on weathering and break-up of oil, ecological impact, and guidance in determining whether it would be better to have full release of all oil remaining within the next month or to accept slow leaching into late spring, early summer months. Could be as much as 1.3 million gallons remaining in bow section.

- Guidance on probabilities of oil entering contiguous zone for the next six months, broken down to weekly periods.
 - Whether trained oil observer should be assigned to continue oil survey flights every other day while possibility of threat exists.
 - Whether there is a need to augment USCG aircraft and flight crews to continue oil survey flights, or if survey flights by EPA or USN A/C could be made available.
 - Need plan for NASA, NOAA, EPA, CG R&D Center, CG OCEANO unit tie-in for continued tracking and assessment of threat after onscene teams have departed Cape Cod. This continued effort and threat possibilities to be coordinated and passed to OSC.
 - Need advice on clean-up contractors which are under CCGDTHREE contracts, if any, and provide listing of equipment, personnel, and response capability.
 - Need advice on Massachusetts State plans for continuing bird cleaning and gathering, through RRT representative.
- 1505 USCG Station Menemsha was requested to conduct beach patrol of Martha's Vineyard from Gay Head Light to Wasque Point daily for pollution sightings.
- 1810
- Overflight provided; no change in condition or position of wreck reported.
 - Onsite (O/S) Weather — Winds 335°T/15 kts., seas 335°T/3 feet.
 - Oil survey flight in the vicinity found oil extending 5 miles North, 15 miles West, and 25 miles South Southwest. No oil was observed Southeast of tanker; C-130 SAR A/C found oil within predicted limits.
 - Bird situation and status as follows: Total to-date: 73 alive, 106 dead.
 - Tug WHITEFOOT was moored at Base, Woods Hole, and AST loaded diving equipment. Copy of report on burn test conducted by SPAR and Coast Guard R&D Center transmitted to COMDT Congressional Affairs.
- 2208 Status of vessel unchanged. Stern section listing 30 degrees starboard. Heading 265°T at position 41°02.2'N, 69°27.5'W. Center section remained sunk. Bow section heading was 295°T, keel up with 3 feet of bottom showing at position 41°02.0'N, 69°27.5'W.

January 5, 1977

- Tug WHITEFOOT was onscene, but unable to commence diving operations due to weather. Bow section reported completely submerged.

- 0950
- Tug WHITEFOOT sighted 4 feet of bow section structure out of water and light oil sheen.
 - O/S Weather — Winds 045°T/25-30 kts., seas 045°T/4-6 feet, current 2-3 kts.
 - Bow section appeared to be in a 20-25 foot deep shoal spot, and stern had a heavy list. Conditions were not suitable for diving operations; Tug WHITEFOOT remained onscene to evaluate sea and tide conditions.
- 1413
- No major oil spots in evidence in pollution overflight. Oil was leaking from bow and stern sections; drift 160 to 180 degrees magnetic runs counterclockwise around site in streaks to approximately 5 miles.
- Weather — Ceiling indefinite, obscured 2600 feet, wind North 15 kts., seas confused due to tide change, ground swells North 6-8 feet.
- 1615
- Received call from Canadian Coast Guard, stating that an oil slick had been located at 43°15'N, 66°08.9'W, and that many oil-soaked birds had been sighted in the area and further out to sea. Requested that a sample of ARGO oil be forwarded, if possible, to Canadian Coast Guard to determine if the oil sighted was from ARGO MERCHANT.
 - One sample of oil was sent to Canadian Regional Emergency Office, Maritimes, P.O. Box 1013, Dartmouth, N.S., via registered mail. (Ultimately determined oil reported was not from ARGO MERCHANT.)
- 1839
- Tug WHITEFOOT was enroute Woods Hole due to poor weather; oil samples collected were to be transferred to MSO Boston.
 - OSC met with Massachusetts State officials, Commissioner Standley, Thomas McMahon and William Marhoffer. Comm. Standley indicated State had resumed normal bird operations and that no more overtime charges would be made against fund. He also reported that the bird receiving center at Nantucket Airport would be open 1400-1700 daily, and that birds were being flown (gratis) by commercial flights to Felix Neck on a space-available basis on daily 1800 flights. He further reported that he would attempt to have appropriate State agency deal with any bird problems through RRT. Two dozen ducks were seen 5 miles Northeast of Nantucket Island by helicopter. Helicopter also unable to get oil sample.

January 6, 1977

- 0747
- Status of vessel remained unchanged. Stern had 20-degree list to starboard, heading 265°T, at position 41°02.2'N, 69°27.5'W. Center section remained sunk; bow section keel was up with 4 feet of bottom showing. Heading was 295°T in position 41°02.0'N, 69°27.3'W.

- 0755 Tug WHITEFOOT unable to locate midship section on January 5. Bow section was in 20 feet of water at forepeak and sloped to a greater depth. Tug WHITEFOOT sample was insufficient due to lack of suitable quantity for analyses. Tug WHITEFOOT proved to be adequate diving platform.
- 1145 CO OCEANO Unit requested to provide the following services:
- A. Continued Surface Slick Tracking
 - 1. Coordination of NOAA BTT buoy data inputs. OSC was to determine if buoy still located in oil concentration earliest possible flight,
 - 2. Recommendations for oil survey flights.
 - B. Assessment of threat of oil impacting U.S. shore
 - 1. 24-hour forecast,
 - 2. Extended 3- to 5-day probability forecasts, and
 - 3. Long-range (6 months) oil drift forecasts.
- 1330 Released one U.S. Army Skycrane and crew.
- 1833 Air Station, Cape Cod, was requested to fly HU16E patrols with the following priority:
- 1. SAR when directed,
 - 2. Oil spill overflights,
 - 3. OFP/ELT, and
 - 4. Routine MEP.
- 1908 • The AST dive on the stern section revealed midship section facing stern section at a 30-degree angle and hull plates and frames badly broken. Area currents were extremely strong. Amount of oil in stern, bridge, and bow sections was undetermined.
- CGC DALLAS oil samples picked up within forecast limits were delivered to R&D Center. Tested oil and results matched samples from ARGO MERCHANT.
- 2000 Cdr. Morgan, Coast Guard OCEANO Unit, planned to return to unit. Oil slick forecasts would be computed at unit and transferred to OSC by message.

January 7, 1977

- 0900 Tug WHITEFOOT was enroute ARGO MERCHANT. AST members were unable to dive due to weather conditions. Helicopter flights cancelled due to weather conditions. Position of BTT buoy 0841 6 January was 38°50'N, 67°25'W.
- 1101 MSO Providence, Rhode Island, personnel met with Massachusetts Division of Water Pollution Control and Division of Marine Fisheries, and Jet Line Service Co. represen-

tatives to formulate contingency plans for Massachusetts portion of MSO Providence zone. Five critical areas were delineated:

- (1) Westport River,
- (2) Apponagansett Bay,
- (3) Slocums River,
- (4) Nasketucket Bay, and
- (5) Mattapoisett Harbor.

Specific plans were to be forwarded to OSC.

1541 COMDT provided the following guidance:

- Suggested oil be tracked as long as it remained in slick, cluster of pancakes, or otherwise discernible form. Tracking may be terminated only after the oil has dispersed to the point that it is no longer identifiable as having originated from the ARGO MERCHANT.
- Predictions of weathering and break-up of the oil were considered within competence of the RRT. Ecological impact assessment effect was being coordinated by EPA. OSC was to be provided with assessment reports as they became available. NRT advised that it was preferable to accept slow leaching with a possibility of recovery of some of the remaining oil through hot-tap method rather than to effect an intentional full release of oil which would result in a second major spill. However, final decision should be predicated on analysis and recommendations of all agencies represented on the RRT. If RRT were unable to decide on appropriate course of action, matter should be referred to the National Response Team for resolution.
- Long-range oil movement prediction model and other oceanographic support were to be provided by USCG Oceanographic Unit, Washington, D.C.

1608 Hourly weather observation from Nantucket Light Vessel was no longer required for oil drift forecasts, but observations every three hours were continued.

1748 • Tug WHITEFOOT arrived at Woods Hole at 1230 and was released due to weather forecast for the next three days, prohibiting diving efforts. OSC met with Air National Guard and Coast Guard Air Station personnel and consolidated funding and contingency plans for cranes and trucks.

January 8, 1977

0855 Scheduled A.M. flights were delayed due to local weather conditions.

1440 OSC passed following information to CCGDONE for their determination of need to augment available aircraft:

- Last oil mapping flight with complete coverage of forecast limits of oil was conducted on 3 January. Since that time, weather and/or SAR commitments precluded

all but local mapping inshore and short distance seaward of the point source. Cape Cod HU16E A/C unable to make any flights due to local snow conditions at Otis AFB.

- COMDT USCG suggested tracking oil until no longer discernible or identifiable as ARGO MERCHANT spill.
- Based on the foregoing, OSC determined need to conduct complete search of area of forecast limits for oil, as contained in MSO communique at first opportunity. This search generally was to cover 10-mile track space for first six legs, thence expand to 15-mile track space. Limits were:

40°26'N	42°00'N
71°20'W	68°45'W
37°20'N	38°55'N
67°55'W	65°15'W

- Particular attention was to be given to large oil pancake on outer limits of area and to the NOAA BTT buoy which was placed in this pancake on 1 January. Need to determine if this buoy still remained in pancake, floating free, or relative position of buoy to oil. Position of BTT buoy was 38°45'N, 67°41'W. Future oil mapping flight needs will be based on amount of oil found in mapping flights. However, one mapping flight for every two days to include BTT buoy if oil is found.
- Believe length of flight and area beyond capability of HU16E. Until such time as other flights were scheduled, intended to use HH3F helicopter for wreck and inshore flights every two days.

1531 OSC requested meeting 0900 on 11 January with RRT at District Office; CO AST was also to attend.

1934 HU16E mapping flight was cancelled due to weather conditions. H3 flight this date revealed one kingpost on bridge section and one kingpost on stern section showing. Bow section was not visible. Slick spotted 600 feet in diameter approximately 500 yards East of wreck. Fishing Rip "WR" buoy found off station; OAN notified.

OSC planned to relocate Command Post to MSO Boston on 10 January; OSC plans to meet with RRT and release oil spill contractors on Nantucket on 10 January. Army Skycrane and crew and Navy Marco skimmers and personnel to be released on 10 January.

January 9, 1977

0225 CCGDONE advised OSC long-range aircraft unavailable due to SAR commitment at present time. Recommended use of HU16E A/C for partial coverage until more suitable aircraft became available.

0830 OSC plans meeting at Command Post with representatives of local fishermen's association to explain forecast system and forecast limits.

- 1130 Planned flight for 9 January delayed due to field conditions at Otis AFB. It was anticipated that the field would open for normal fixed-wing operations 1500-1700 on 9 January.
- 1440 Lt. J.G. Poole, MSO Boston, phoned Mr. M. Todd, Jr., Chairman, Board of Selectmen, Nantucket. Mr. Todd was advised of the following:
- OSC's intention to wind down operations on Nantucket, including removing two commercial contractors and MSO personnel. Mr. Todd agreed that at the present time operations on Nantucket could be decreased without endangering Nantucket Island. Mr. Todd was also satisfied with the contingency plan, should the situation change causing the oil slick to endanger Nantucket Island. Mr. Todd was advised that Lt. J.G. Poole would be available on Nantucket during 10 and 11 January should any questions arise.
- 1552 • Hired tug WHITEFOOT for AST diving operations to commence on 12 January. Released remaining Army Skycrane and crew members and Navy Marco skimmers.
- Released Jet Line Services and Coastal Services on Nantucket based on present status of the stern, middle and bow sections of the ARGO MERCHANT, including survey conducted by AST divers; present location and forecast limits of the oil slick; and the fact that the oil slick and the wreck site would continue to be monitored by overflights, the shoreline of Nantucket would be inspected daily by the Coast Guard personnel, and that commercial clean-up equipment could be restored to maximum strength on Nantucket within 48 hours. A full contingency plan was also established.

January 10, 1977

- 0715 Contacted Coastal Services and Jet Line Services to cancel release of equipment on Nantucket until scheduled meeting at 1700 with Commonwealth of Massachusetts.
- 0730 Contacted U.S. Navy and instructed them to cancel release of Marco skimmers. HU16E mapping flight was cancelled due to weather conditions.
- 0845 OSC Command Post relocated to MSO Boston.
- 1700 • A meeting was held and attended by CCGDONE, OSC rep, Mass. Lt. Gov. O'Neill, Mass. Secretary of Environmental Affairs Murphy, and the Chairman RRT at which the release of oil spill control equipment was discussed. The meeting resulted in agreement between Federal and State governments to maintain clean-up contractors on station on Nantucket Island. The OSC was unable to attend this meeting because of the sinking of the coastal oil tanker Chester A. Poling off Gloucester, Mass.
- OSC planned to meet with RRT on 11 January.
- 2037 Storm warnings were changed to gale warnings from Merrimack River to Block Island. West to Southwest winds 25-40 knots with a few gusts to 45 knots; seas 8 to 13 feet.

January 11, 1977

- 0823 Vessel status was unchanged. Stern and center sections were sunk in position 41°02'N, 69°27.5'W. Bow section was not sighted on last overflight and presumed sunk in position 41°02.0'N, 69°27.3'W.
- 0940 CCGDONE radiomen assigned TAD to Coast Guard Air Station, Cape Cod, were released to their respective commands.
- 0949 Fish and Wildlife Service renewed contract with Manomet Bird Observatory to continue bird operations in response to ARGO MERCHANT spill. In cooperation with this effort, approval was granted Mr. Kevin Powers of Manomet Bird Observatory to ride on DECISIVE 19 January - 2 February.
- 1000 • Capt. Hein met with RRT to discuss alternatives and receive advice on how to proceed with them. Also requested long-range aircraft for survey.

Based on briefings by participating cognizant agencies and observations by AST divers, OSC believed no oil remained in the stern and center sections of the tanker. The amount of oil left in the bow section of the vessel was not known. The OSC estimated 1.3 million gallons were the most that could remain aboard the bow section.

After much analysis and consideration, the RRT unanimously recommended, in order of priority, the following options:

- Release any oil in the bow section by aerial bombardment. The release of oil under weather and current conditions experienced during winter months is considered preferable to leaking of oil at other times which would create a greater environmental threat.
- If bombardment fails, commercial divers to release any oil by selective demolition.
- Recover oil by hot-tap method as suggested by Murphy Pacific. This option is considered to be extremely dangerous considering the area of wreck and impracticality of long-term positioning of floating support equipment. Additionally, the operation would be very costly, lengthy and possibly non-productive.
- Take no action and allow release of oil by natural leaching.

Based on these options, the OSC decided to pursue the basic preliminaries leading to the alternative of bombardment, unless advice to the contrary was received from the NRT. To accomplish aerial bombardment, the following action was to be taken:

- Ascertain the exact location of the bow section;
- Request DOD supply target analysis and suitable aircraft for operations;

- Coordinate operations with weather forecasting by NOAA/NWS to ensure a prevailing westerly wind; and
- Complete operations as soon as possible, but no later than February 1, 1977, weather permitting due to offshore movement of oil during this period.

After bombardment, would conduct diving operations to evaluate effectiveness.

OSC and RRT consider oil mapping flights to be vital to response activities. NOAA aircraft to conduct mapping flights 12 and 13 January due to unavailability of CG long-range aircraft engaged in SAR and other pollution responses.

- 1710
- NOAA C-130 aircraft was scheduled to arrive Coast Guard Air Station, Cape Cod, morning of 12 January for mapping flight; 20 flight hours allotted this project. HU16E overflight this date could not be completed due to weather conditions. Wreck of subject vessel was not visible.
 - Coast Guard OCEANO Air Observer set up in office at Coast Guard Air Station, Cape Cod.
 - Rescheduled Tug WHITEFOOT for 1200 13 January for AST dives.

January 12, 1977

- 0847 NOAA C-130 arrived Cape Cod for survey of slick boundaries.
- 0930 MSO Boston to send one pollution report (POLREP) per day prior to 1600 hours.
- 1030 NOAA C-130 airborne for oil slick mapping flight (Figure 15).
- 1035 HH-3F flew 10- and 20-mile area to the South and Southeast of Nantucket; no oil was sighted.
- 1547 Lighted gong buoy "WR" reported missing. Subject buoy to be relocated and placed 41°01.7'N, 69°26.8'W.
- 1600 AST plans to dive on bow of vessel were cancelled due to weather conditions. AST dives planned for week of 17 January.

Tug WHITEFOOT was rescheduled for 1200 on 17 January.

Results of NOAA C-130 mapping flight were to be plotted when completed.

- 1602 From Coast Guard R&D Center, Groton, Conn.:

CGC EVERGREEN enroute from New London to standard Section A-5 oceanographic operation, was requested to carry out the following special sampling program as weather conditions permit:

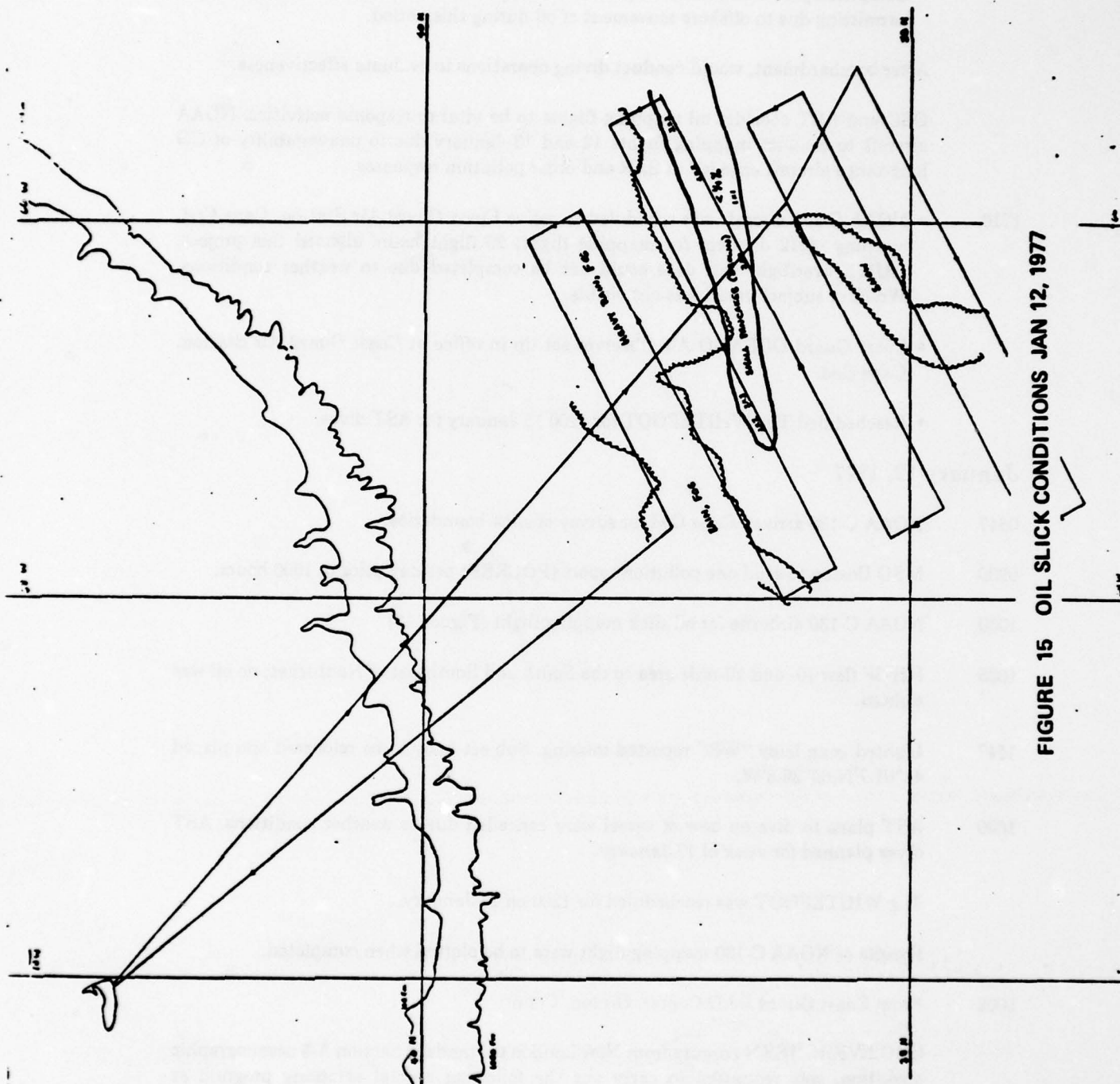


FIGURE 15 OIL SLICK CONDITIONS JAN 12, 1977

- Proceed to presumed location of sunken bow section of ARGO MERCHANT at 41°02.0'N, 69°27.3'W (as of 11 January, 0823R) and determine exact location of bow with depth recorder;
- Select a station location at a safe operating distance from the wreck and obtain the following samples:

Water Samples — Use "SLURP" bottles to collect an uncontaminated sample from surface and from a depth of 5 meters. Extract water samples with hexane in separatory funnels. Drain extracts into precleaned 120-ml bottles and store in refrigerator.

Bottom Samples — Collect five bottom samples with the modified Vanveen grab now in EVERGREEN's custody. Skim surface of each bottom sample with trowel and place into precleaned 8-oz. jars and store in freezer.
- Occupy four or more additional stations within a 10-mile radius of wreck, as time allows, and repeat above procedure. Keep log of station positions and corresponding sample bottle numbers.

January 13, 1977

- 1037 NOAA C-130 aircraft departed OTIS AFB for second day of survey [Figure 16].
- 1055 Results of NOAA C-130 mapping flight conducted on 12 January in following oil forecast limits:

38°50'N, 68°20'W
 39°50'N, 65°15'W
 37°30'N, 67°35'W
 38°10'N, 65°15'W, were reported as:

visibility over parts of the area was bad due to fog and snow. Spotted small (2' x 2') pancakes 10 miles North of BTT plotted position 38°35'N, 65°55'W. Buoy was not visible. No slicks were observed and no oil in the area of BTT plotted position.

NASA photo flight of slick/wreck area was to be scheduled when weather permitted.

- 1549 Message from COMDT, COGARD, Washington, D.C.

A meeting of the NRT was held on January 13 to consider the option posed by RRT. Members of NRT desire additional information on weather forecasting, historical weather data, and possibility of quantifying amount of oil remaining in bow section. Agencies represented on the NRT also desire additional time to develop agency positions on option available. Desired information being developed by NRT members responsible for these disciplines.

The next meeting of NRT was scheduled morning of 21 January. Recommended no action on destroying bow section until NRT completed its analysis.

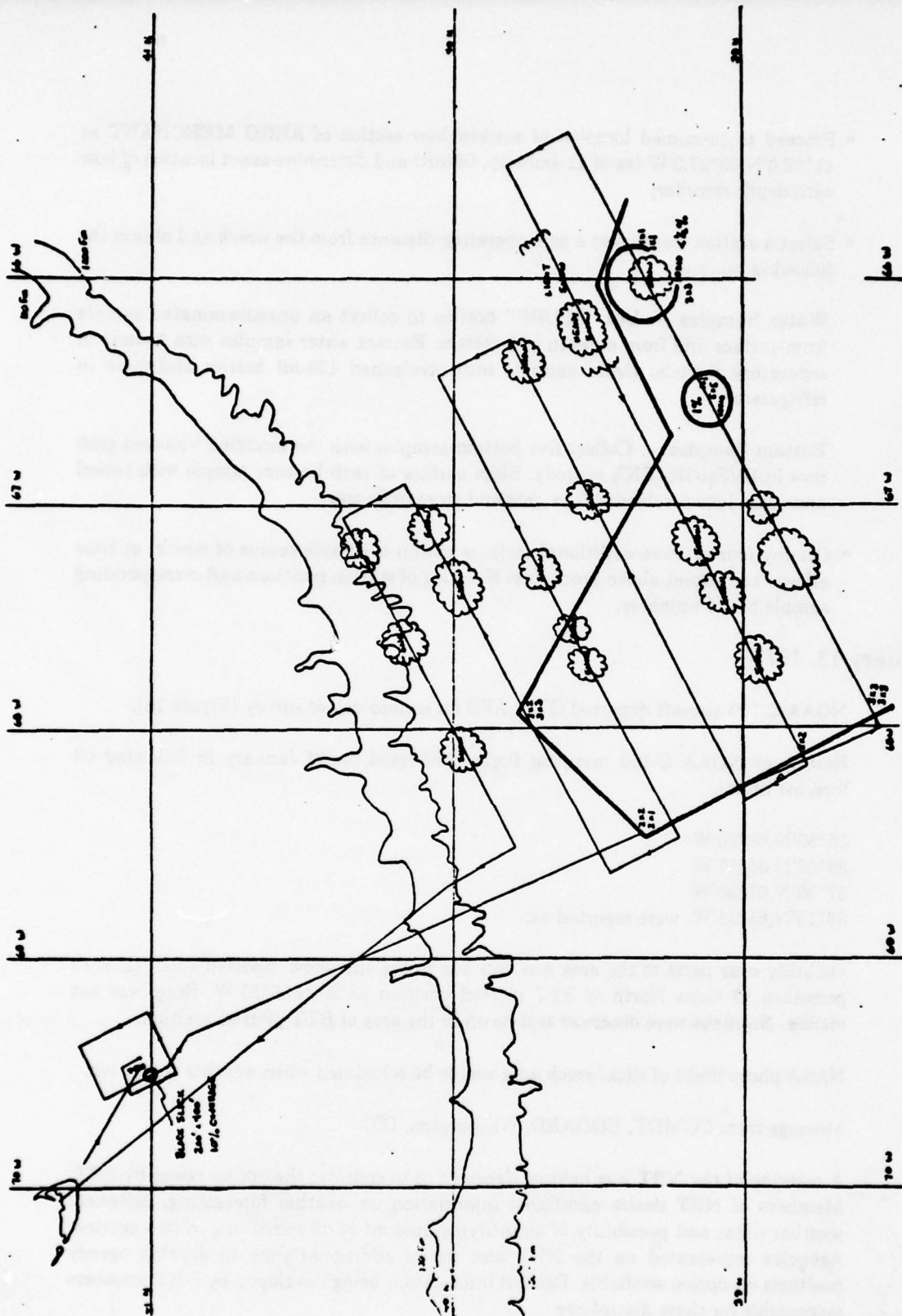


FIGURE 16 OIL SLICK CONDITIONS JAN 13, 1977

- 1630 NOAA C-130 aircraft arrived Cape Cod.
- 1700 OSC met with Lt. Gov. O'Neill, CCGDONE, Secretary Murphy, Chairman RRT et al. All mutually agreed to maintain cleanup contractors on Nantucket.
- 1935 NOAA C-130 overflight 13 January, located wreck buoy from ARGO MERCHANT at position 40°57.8'N, 69°28'W.

January 14, 1977

- 1510 OSC requested from USN that the four Marco V skimmers stored at Coast Guard Air Station, Cape Cod, be retained at this location until decision as to the threat of pollution was made, possibly by 21 January. Also requested that Mr. James Hayes and skimmer operators be retained on a 24-hour standby.

- 1612 Results of NOAA C-130 mapping flight conducted on January 13, as follows:

Weather: Isolated heavy snow showers in area mapped. Wind from Northwest 20-30 knots, seas 10 to 15 feet. Oil pancakes spotted within the area bounded by the following coordinates:

39°21'N	39°34'N
68°28'W	66°07'W
39°49'N	39°27'N
67°59'W	65°45'W
39°18'N	38°37'N
66°47'W	68°00'W

Scattered individual sightings of oil pancakes at the following coordinates:

Size:	Size:	Size:	Size:	Size:
2'x2'	3'x3'	3'x3'	1'x1'	10'x10'
1'x1'	3'x3'	2'x2'	1'x1'	2'x3'
39°22'N	38°25'N	39°45'N	39°25'N	39°16'N
68°27'W	67°55'W	67°55'W	65°52'W	66°10'W

Two large concentrations sighted with pancakes as large as 10 by 10 feet in area in positions:

39°10'N	66°35'W
39°16'N	66°10'W

10 percent of one 200- by 400-foot area covered with slick, sighted 4 miles Southwest of wreck site. Sighted one kingpost of subject vessel; no oil sighted in immediate area of wreck. AST dives, using tug WHITEFOOT as platform, planned for 17 January.

Coast Guard Air Station, Cape Cod, to schedule mapping flight for 15 January, then every other day, 10 miles seaward of wreck site to Nantucket. Also schedule HU16E mapping flight of Northwest portion of oil forecast limits 17 January, then every four days.

1800 Results of H-3 mapping flight conducted on January 14 as follows:

All oil was sighted within positions bounded by:

41°04'N	41°06'N	41°01'N	41°03'N
69°33'W	69°28'W	69°31'W	69°26'W

20 percent concentration. Oil was in numerous small slicks 10 by 100 feet long and 5 by 15 feet wide, emanating from small clumps of brownish oil pancakes and trailing downwind. Subject vessel kingpost located at 41°03'N, 69°28'W.

O/S Weather: Wind Southwest at 10 kts., seas 5 feet.

January 15, 1977

- 0800 • Unable to conduct oil mapping flights due to weather conditions.
- Oil slick forecast: Expect off-shore movement of oil 17-19 January and on-shore movement to within 12 miles of Nantucket on 21 January.
- BTT buoy position: 38°39'N, 60°58'W.

January 16, 1977

- 0908 Vessel's status was unchanged. Stern and center sections sunk at position 41°02.2'N, 69°27.5'W. Presume bow sunk in position 41°02.0'N, 69°27.3'W.
- 1300 HH3F helicopter completed oil survey with good visibility. No oil sighted. "WR" buoy spotted 40°57'N, 69°26.8'W. Believed to be anchored. Weather and track of oil survey to be furnished to MSO Boston.
- 1425 Coast Guard OCEANO, Washington, D.C., pollution outlook 18-21 January. Expect offshore movement on 18 January. Expect onshore movement to within 22 miles of Nantucket on 19 January. Expect offshore movement on 20 and 21 January.

BTT buoy position 38°57'N, 60°24'W as of 1101 16 January.

January 17, 1977

- 1340 Coast Guard OCEANO, Washington, D.C., expects onshore movement of oil on 22 January, to within 14 miles of Nantucket.
- BTT buoy position 38°45'N, 60°08'W at 0400 17 January.

1600 HU16E mapping flight commencing 1300 on 19 January.

At the suggestion of Senator Brooke, a public meeting concerning subject vessel and the alternatives concerning the bow section, discussed at the RRT meeting, was scheduled for 1400 on 19 January at the Lawrence School, Falmouth, Mass. Topics of discussion included: bombing, shelling, slow leach and hot tapping.

1605 Oil survey not flown this date due to unavailability of aircraft. Survey rescheduled for 19 January.

January 18, 1977

0949 Pollution incident case analysis of ARGO MERCHANT — A four-member board was convened by Commander, Atlantic Area. Board anticipated interviewing participants and gathering initial information in Boston and other location in CCGDONE 25-27 January. The sole purpose of the Board was to "identify those procedures and techniques that were found to be effective and those that were found to be ineffective or deficient in combatting pollution or threatened pollution so that the overall Federal pollution response effort could be improved.

1329 HH3 dropped datum marker beacon in position of ARGO MERCHANT. No pollution was sighted.

1515 HH3 survey was incomplete due to weather conditions. Onscene weather: Winds 250°T/45 kts., ceiling 300 feet, visibility 1 mile, seas 8-12 feet, from 250°T.

1626 HU16E oil slick mapping flight cancelled due to aircraft problems. Partial HH3 oil slick mapping flight results were as follows:

Launched datum marker buoy at position 41°02'N, 69°28'W, visibility bad in snow, no oil was spotted.

- Tug WHITEFOOT was loaded with AST diving gear and was standing by waiting for suitable weather.

January 19, 1977

0930 OSC, Chairman RTT, NOAA, EPA, NMFS, CGOCEANO UNIT, CO AST, USN participated in public meeting concerning disposition of bow section at Falmouth, Mass. Transcription was made and forwarded to NRT. OSC chaired meeting.

1620 HH3 oil slick mapping flight commenced 1000 and was still in progress.

January 20, 1977

0030 Tug WHITEFOOT and Atlantic Strike Team were underway enroute ARGO MERCHANT for diving operations.

- 0825 Forward progress of tug WHITEFOOT was impeded by ice. Making slow forward progress at Great Point.
- 1345 Tug WHITEFOOT hove to vicinity of wreck buoy. Wind West Northwest 30 kts. with gusts to 38 kts., seas 6 feet.
- 1535
 - Requested helicopter overflight early 21 January AM to locate wreck if possible. 19 Jan overflight by HH3 found very light sheen, 10 percent coverage within 2-mile radius of subject vessel wreck site. EST DM buoy position 40°55.4'N, 69°15.5'W. "WR," buoy located at position 40°56.8'N, 69°27.7'W.
 - AST was to conduct dive operation on the bow section of the vessel weather permitting. HU16E oil slick mapping flight was scheduled for 12 January.
 - Copy of transcript of public meeting forwarded to NRT.

January 21, 1977

- 1035
 - Tug WHITEFOOT is searching Fishing Rip area for any signs of ARGO MERCHANT.
 - Weather — Winds 15 kts., seas 2 to 3 feet.
 - Requested helicopter overflight with Loran-C and VHF-FM communications.
- 1320 Helicopter departed Air Station, Cape Cod, to assist tug WHITEFOOT in location of ARGO MERCHANT.
- 1400 Weather — Winds 285°T/10 kts., seas Northwest/2 feet, winds and seas increasing.
- 1502 MSO Boston (OSC) to CCGDONE Boston —

Requested suitable aircraft be made available to conduct oil mapping flight week of 24 January, as recommended by COMDT COGARD.

The mapping flights were to cover forecast limits of oil on day of flight:

One flight from position 41°09'N, 69°32'W to 39°05'N, 66°08'W, thence to position of BTT buoy 38°46'N, 59°47'W. Map to 30 miles in vicinity of buoy. Return parallel track with track spacing of 15 miles to the North.

One flight to map area bounded by 41°09'N, 68°00'W, 40°38'N, 68°48'W, 37°30'N, 67°35'W, 37°49'N, 66°15'W, 40°13'N, 65°37'W. Track spacing to be determined by type of aircraft available.

One flight to map area bounded by 40°38'N, 68°42'W, 40°00'N, 69°30'W, 37°30'N, 67°35'W, 37°49'N, 66°35'W, 38°47'N, 66°15'W.

Actual boundaries to be determined from more recent forecast limits preceding day of flight.

Due to extensive limits of flights, suggested long-range aircraft be assigned, and due to actual charges against pollution fund, suggested USCG aircraft be utilized. Last mapping flight was conducted on 12 and 13 January. Future flights to be scheduled based upon amount of oil located next flight.

- 1621 HU16E mapping flight found one sheen, 2 feet in diameter, near kingpost of subject vessel. No other oil was observed during the flight.

Tug WHITEFOOT was onscene with AST divers standing by for suitable weather for diving operations.

HH3 mapping flight was scheduled for 23 January. Planned to drop datum marker buoy on wreck site and planned extended oil slick mapping flight week of 24 January, subject to aircraft availability.

- 1801 MSO Boston (OSC) to Chief Naval Operations (CNO), Washington, D.C. —

Request advice on availability of vessel to provide stable diving platform, extra diving teams, and diving support functions for survey of wreck of tanker ARGO MERCHANT and determination of amount of oil remaining aboard.

Wreck is located offshore, 27 miles from Nantucket Island in position 41°02.2'N, 69°27.5'W in 25 to 74 feet of water. Vessel to be capable of mooring over or near wreck site and remain onscene in poor weather conditions, while awaiting proper weather to dive. Berthing and messing for one officer and three enlisted U.S. Coast Guard divers should be provided aboard. Request advice on daily costs if such vessel is available.

- 1806 COMDT USCG, Washington, D.C., to CCGDONE: NRT sends to RRT — NRT met 1100 on 21 January to consider options for disposing of oil remaining in ARGO MERCHANT bow as requested by CCGDONE.

Lt. Governor O'Neill and Secretary of Environmental Affairs Murphy represented the Commonwealth of Massachusetts as Ad Hoc members.

The NRT recommended that before any decision was made on disposing of the hulk and any residual oil onboard, the following actions be taken:

- The precise location and orientation of the bow be determined;
- The amount of oil remaining in the tanks be determined;
- A survey of the bow section be conducted to determine its structural integrity and ability to remain intact during oil-recovery operations, should these operations become feasible. Survey should also attempt to determine probability of hulk remaining intact should decision be made to do nothing.

- Samples of residual oil should be analyzed to determine the physical behavior of the oil should it be released. Recent experience with this type of oil in another casualty indicated oil sank at temperatures below 51°F.
- The NRT recognized that all of their activities would be weather-dependent. It was recommended that the Navy Supervisor of Salvage be contacted for technical assistance in accomplishing their tasks. Very brief windows, when diving operations could be conducted, indicated a suitable vessel should be provided to remain on-scene to take maximum advantage of these diving opportunities. A suitable vessel could also be obtained through the Supt. of Salvage.
- NOAA offered a weather prediction team to maintain an updated forecast for the OSC during diving operations if desired.
- Because of current logistics difficulties caused by ice, uncertainty of oil remaining in the bow section, and the possibility of oil coming ashore on Nantucket should inadvertent or accidental release occur, the NRT recommended that the standby response equipment now staged on Nantucket be retained until the situation was better defined. Surveillance patrols of the beach and overflights of the area should be continued at present levels.
- NRT will reconvene to consider results of planned action cited above as soon as they become available. No action on the options discussed at the RRT meeting was to be taken until NRT had evaluated these data as they applied to the available options.

2302 Helicopter located wreck late afternoon. AST launched Zodiac boat with chart depth recorder. Strong current running causing severe rip where bow used to be. Negative results in search for bow. Recorder did not indicate any solid pronounced structure more than 15 feet off bottom near kingpost or where bridge used to be.

January 22, 1977

0715 Tug WHITEFOOT returned to Woods Hole. Weather — Winds 25-30 kts., seas 5-6 feet and increasing.

January 23, 1977

1020 Helicopter dropped datum marker buoy at wreck site.

Onscene weather: Ceiling 500 feet, overcast, visibility 8 miles, winds 325°T/18 kts., seas Northwest at 3-5 feet.

1730 Status of vessel unchanged. Tug WHITEFOOT off hire due to weather. Plan to use USN vessel to continue diving operations in future.

2015 Status of vessel was unchanged. HH3 mapping flight conducted on 23 January, was as follows: Two slicks were located approximately 200 yards East of subject vessel kingpost. One slick was 100 feet long and 30 feet wide with 10 percent coverage. The other was half as large. Planned to conduct HH3 oil slick mapping flight to locate data marker buoy.

January 24, 1977

1004 From CNO Washington, D.C., to MSO Boston: —

Vessel requested to provide stable diving platform, extra diving teams, and diving support functions for survey of ARGO MERCHANT wreck and determination of oil remaining aboard:

Availability of USS RECOVERY (ARS-43) advised, plus additional divers as necessary. Daily costs for USS RECOVERY to be \$4,200.

1809 Requested suitable aircraft be provided to map ARGO MERCHANT oil beyond capability of Coast Guard Air Station, Cape Cod.

1930 Formally requested the services of USS RECOVERY (ARS-43) to provide stable diving platform and diving support functions for survey of wreck. The services of additional Navy divers were not necessary. Requested USS RECOVERY to depart in time to arrive Newport, R.I., 0900 on 27 January.

LCDR Chambers, CO Atlantic Strike Force, plus three enlisted AST divers, planned to meet USS RECOVERY in Newport, R.I., on 27 January. LCDR Chambers also planned meeting with USS RECOVERY prior to her departure Little Creek, Va., for briefing.

January 25, 1977

1209 USN ASR RECOVERY underway to Newport, Rhode Island, to arrive AM 27 January. Upon arrival Newport, Rhode Island, embark Coast Guard diving and survey personnel and associated equipment. Upon completion of load-out, get underway and proceed ARGO MERCHANT survey site vicinity 41°02.2'N, 69°27.5'W. Upon arrival at survey site, provide diving support as requested by senior member Coast Guard diving and survey team, and submit daily situation report (SITREPS) as required.

1309 OSC requested subject incident fund ceiling be increased by \$300,000 to a new ceiling of \$1.8 million. Additional funds necessary due to use of Navy ARS for diving support functions for survey of wreck, the need for oil slick mapping flights, the necessity of maintaining patrols of beaches, and overflights of area. Estimated total cost to date \$1,322,733.

1505 Helicopter overflights of Wellfleet area and ARGO MERCHANT site to Nantucket not flown due to fog. Forecast weather for daylight hours 25 January made completion doubtful. Flights rescheduled for 26 January.

1601 SAR requirements allowed one C-130 from CGAS, Elizabeth City, to be available for subject operations (to map ARGO MERCHANT oil beyond capability of Coast Guard AIRSTA, Cape Cod). Extent of subject flights was near 8-hour endurance limitation. Liaison with DOD agencies suggested for possible availability of other resources.

USS RECOVERY ETA Newport, R.I., 0800 27 January.

January 26, 1977

0800 HH3 helicopter oil slick mapping flight airborne.

Estimated total cost to date: \$1,331,973.

BTT buoy position: 37°06'N, 59°37'W.

1041 Requested NWS include USS RECOVERY as info addressee on special forecast for the Fishing Rip area until further advised.

1050 MSO BOSTON (OSC) to USS RECOVERY: — In addition to other reports required, request surface weather observations at 3-hour intervals, commencing 0000Z when onscene at Fishing Rip. These observations are to be sent to National Weather Service, Boston, Mass., and are to include short word description of weather, cloud cover, wind direction and force in knots, sea direction and height, barometric reading, and air and sea temperatures.

Weather — Fishing Rip ceiling 2000 feet scattered, visibility 15 miles, winds 280°T, seas Northwest 6 feet, temperature — 2°C.

1555 Request for subject incident fund ceiling to be increased by \$300,000 to a new ceiling of \$1.8 million was approved.

1645 MSO Boston (OSC) requested Coast Guard Air Station, Cape Cod, provide HH3 flight to wreck site to locate vessel for USS RECOVERY, ETA site area (AM) 28 January. USS RECOVERY planned to dock berths 121, Pier 1, U.S. Navy Base, Newport, R.I. USS RECOVERY planned to depart Newport, R.I. PM of 27 January for wreck site, with AST divers onboard. ETA wreck site was provided to CG Air Station by MSO Boston; frequent communications with USS RECOVERY were also provided to MSO Boston through phone patch, Brant Pt. CG Station.

1705 Status of the vessel remained the same.

HH3 oil slick mapping flight conducted this date with the following results:

Weather onscene: Winds 280°T/30 kts., seas 5 feet. Description of oil sighted: two small streaks (2-3 feet) at subject vessel kingpost, one small streak (3 feet) one mile north of kingpost, no other oil sightings this date. Data marker buoy located at position 40°50.3'N, 69°25.9'W at 0930. Extended oil slick forecast limited mapping flight scheduled for 27 January, using C-130 and HU16E aircraft.

January 27, 1977

1106 C-130 departed Coast Guard Air Station, Cape Cod, for oil slick mapping flight to BTT buoy position.

1700 • USS RECOVERY was moored at Newport, R.I., 0800 for embarking AST divers and diving gear.

- Planned extended HU16E oil slick mapping flight on 28 January. Planned HH3 flight to wreck area for oil slick sightings.
- USS RECOVERY ETD Newport 1600 27 January; ETA wreck site 0700 28 January.

1720 C-130 reported last 300 miles of return track observations omitted due to adverse weather conditions. No sightings of oil or buoy reported.

January 28, 1977

1051 • Tar balls were found on 51 miles of beach at Cape Cod. OSC in process of having these cleaned up and requested sample analysis at USCG R&D Center.

- From COMDT USCG, Washington, D.C., to USCG R&D Center, Groton:

Confirmed tar ball sample analysis within the scope of ongoing ARGO MERCHANT support activities. R&D Center conduct analysis of subject tar balls to compare with oil from M/V GRAND ZENITH* and ARGO MERCHANT.

1120 At 0820 helicopter departed Cape Cod enroute ARGO MERCHANT. Sighted narrow sheen of oil 1 mile long extending to West from kingpost.

Weather: Winds from West at 15 kts., visibility unlimited, seas 5-6 feet. Strong current noted moving from East to West.

1332 HU16E arrived Cape Cod; aborted mapping flight due to mechanical problems. Completed survey of 50 percent of assigned area.

1515 From Coast Guard R&D Center to CCGDONE BOSTON:

Bottom photographs from EVERGREEN showed very clean bottom with no apparent oil contamination. Complete report was being telefaxed direct.

1607 From R&D Center to MSO Boston:

Tar balls from Wellfleet, Mass. (Newcomb Hollow Reach) were not from either ARGO MERCHANT or GRAND ZENITH, based on gas chromatography, fluorescence, and infrared spectroscopy. These results were based on analysis of the tar balls directly and also after removing massive polar impurities (probably of recent biological origin).

1708 • HU16E spotted two 2- by 2-foot oil pancakes, both brown in color; no other oil spotted. HH3 oil spotting flight sighted light sheen near vessel kingpost, 10 by 15 feet wide extending 1 mile to the West.

- USS RECOVERY planned to return to Newport, R.I., due to heavy weather. Planned to return to wreck area when weather permitted.

* The M/V GRAND ZENITH sank well offshore with all hands during the ARGO MERCHANT response action.

- Planned HH3 oil spotting flight on 30 January, and planned extended oil slick mapping when weather permitted.

1800 Weather report from USS RECOVERY: 40°47'N, 70°09.5'W; winds: 154°T/25 kts.; seas 185°T/1 foot; swells 185°T/4 feet; sea temperature 33°F; cloud cover 10 percent; barometer 29.50.

1845 At 0800 USS RECOVERY arrived on station. Began search for ARGO MERCHANT. Coast Guard H-3 helicopter from Cape Cod assisted in locating kingpost on stern section of wreck 0900. With wreck located, Coast Guard team in rubber boat attached salvage balloon to wreck and began searching for the bow section with depth recorder. Current estimated at approximately 4 knots. Second rubber boat launched with grapnel and additional salvage buoy to mark bow section when found. First boat passed over hard contact 12 feet below surface in correct position, but was unable to return to exact spot due to current. Marker placed at approximate location; search commenced around marker. Weather began deteriorating about 1100, second boat experienced broken outboard motor bracket resulting in loss of the motor. Full throttle operation necessary to operate in current. Both boats recalled, departed area in rapidly building swells at 1400. Depth recorder failed shortly before boat recall. Severe gale forecast enroute area, predicted to last until Tuesday. Intentions were to proceed along return track to Newport, entering port AM 29 January, unless gale precluded safe entry. Coast Guard representative was to obtain replacement outboard. Intent was to return to site and resume search/survey as soon as the weather permitted.

2120 Weather report from USS RECOVERY:— 40°55.4'N, 71°45.7'W; winds: 156°T/33 kts.; seas 160°T/4 feet; swells 195°T/9 feet; sea temperature 36°F; cloud cover 10 percent; barometer 29.20.

- Barge BN065 ran aground in Buzzards Bay in heavy ice, spilling 81,146.9 gallons No. 2 fuel oil. Additional MSO Boston resources diverted to this response.

January 29, 1977

1728 ETD USS RECOVERY Newport, R.I., for wreck site was 31 January, weather permitting.

January 30, 1977

1127 HH3F returned to Cape Cod after oil survey and Sandy Neck overflight. Report of pollution was forwarded to MSO Boston.

Weather forecast: Fishing Rip sky 800 feet obs., visibility 50 miles in snow, winds 300°T at 30 kts., seas Northwest 6-8 feet, temperature (-2°C) 2°C.

Suspected pollution in Sandy Neck area determined to be ice particles, causing sheen due to low winds.

January 31, 1977

- 1400 USS RECOVERY is underway for search and diving operations on bow of ARGO MERCHANT.
- 1800 Weather report from USS RECOVERY: 40°10'N, 71°15'W; winds 265°T/26 kts.; seas 265°T/1 foot; swells 210°T/6 feet; sea temperature 38°F; cloud cover haze; barometer 29.60.
- 2100 Weather report from USS RECOVERY: 41°02'N, 70°47'W; winds 275°T/32 kts.; seas 270°T/2 feet; swells 225°T/10 feet; sea temperature 43°F; cloud cover broken; barometer 29.64 steady; winds no change.

February 1, 1977

- 0920 HH3 completed ARGO MERCHANT overflight plus overflight from 10 miles south of wreck site to South beaches on Nantucket. Kingposts of ARGO MERCHANT observed at 41°02.1'N, 69°28.0'W; WR buoy observed at 40°57.3'N, 69°26.7'W. No pollution sighted.
- 1723 USS RECOVERY reported USCG Strike Team personnel returned to ship with replacement equipment at 1130 on 31 January. Underway for site at 1400 on 31 January, with ETA 0800 on 1 February. Conducted briefing of Navy and USCG divers using slides of ARGO MERCHANT for familiarization with general configuration and tank areas to be inspected.

Coast Guard helicopter was onscene and reported kingpost still above water and visible 75 percent of the time, but salvage floats planted on 28 January, no longer present. Large Navy buoy with 10,000-pound clump originally marking wreck position has been carried approximately 3 miles South. Twelve-foot seas (with 15-18 foot breakers over Rip) and 35-knot winds precluded diving operations and made close approach to wreck dangerous. Expected lull not materializing this evening, wind/seas remaining high.

Intend to remain at sea just South of Nantucket shoal in order to make best use of any break in the weather. NWS Boston was estimating possible brief return to favorable conditions early Thursday. USS RECOVERY was beginning to ice up from spray, but not to a point where stability was affected.

- 1800 Weather report from USS RECOVERY: 40°45'N, 69°33'W; winds 292°T/28 kts.; seas 292°T/3 feet; swells 250°/11 feet; sea temperature 38°F; cloud cover, 0.5 cumulus; barometer 29.26; swells picking up, winds dying.
- 2100 Weather report from USS RECOVERY: 40°43'N, 69°35.5'W; winds 299°T/32 kts.; seas 305°T/3 feet; swells 305°T/10 feet; sea temperature 34°F; cloudy.

February 2, 1977

- 0630 Weather report from USS RECOVERY: Obv. time: 1200Z; 40°40.53'N, 68°43'W; winds 305°T/35 kts; seas 305°T/3 feet; swells 270°T/12 feet; sea temperature 34°F; cloud cover SCT; barometer 29.97; wind holding, no break in the weather.
- 0815 CGC VIGILANT sighted drift board NR 2 in position 40°21'N, 70°59'W. Board was definitely one of three deployed by that unit during ARGO MERCHANT incident. Board was weathered, retroreflective tape was missing, NR clearly identifiable. No oil sighted in the vicinity.
- 0900 Weather report from USS RECOVERY: Obv. time: 0214; 40°41'N, 69°39'W; winds 324°T/30 kts.; seas 324°T/3 feet; swells 290°T/7 feet; sea temperature 34°F; cloudy cover 0.2 cumulus; barometer 30.08, but rising considerably; winds picking up.
- 1208 In overflight from Nantucket to wreck site, no oil was observed on northern portion of assigned area.
- 1553 Vessel conditions were unchanged. USS RECOVERY on-site, but unable to conduct diving operations due to weather.
- 1623
- Fishing Rip weather: clear, wind Northwest 25 kts.
 - HU16E extended oil slick mapping flight made and reported no oil sightings.
- Advice requested by CGAS Cape Cod on whether further fixed-wing effort was required offshore of ARGO MERCHANT site. OSC required only helicopter overflights 10 miles South of wreck to Nantucket every other day until further advised.
- 1830 USS RECOVERY requested helicopter at 0700 3 February to assist in location of ARGO. USS RECOVERY O/S at daybreak. Weather forecast was favorable. Wanted to take full advantage of weather break, if possible.
- 2100 Weather report from USS RECOVERY: Obv. time: 0302; 40°56'N, 69°28'W; winds 310°T/25 kts.; seas confused/1 foot; swells 305°T/5 feet; sea temperature 33°F; cloud cover zero; barometer 30.17; weather better, winds diminishing, outlook good.
- 2200 USS RECOVERY reported heavy weather precluded approach on wreck site. Both Fleet Weather, Norfolk, and National Weather Service, Boston, were predicting more favorable conditions AM 3 February. Coast Guard helicopter was to deliver bottom profile vicinity of wreck site to ship at 0800 on 3 February. Intent was to move into wreck position first light; decision to moor or remain underway was to be based on magnitude of current. Current table indicated least current at approximately noon. Provided diving operations possible (current window coincides with good weather), RECOVERY divers intended to survey main portion of wreck, and Coast Guard AST divers to locate and survey the bow. Small additional ice build-up; no effect on seakeeping.

2400 Weather report from USS RECOVERY: Obv. time: 0306; 40°48.5'N, 69°31'W; winds 294°T/16 knots; seas 294°T/1 foot; swells 300°T/3 feet; sea temperature 33°F; cloud cover zero; barometer 30.15. Wind was dropping, other conditions seemed stationary.

February 3, 1977

1005 Status of vessel remained unchanged.

1200 Weather report from USS RECOVERY: Obv. Time: 0317; 41°03'N, 69°28'W; winds 218°T/19 knots; seas confused swells; 210°T/2 feet; sea temperature 36°F; cloud cover haze; barometer 29.91, but dropping steadily.

1341 Irregular patches of oil were sighted by Coast Guard helicopter in vicinity of kingpost.

1930 • USS RECOVERY reported favorable weather allowed location and survey of main hull portion of ARGO MERCHANT; ship anchored on Rip. Main hull structure virtually destroyed. Small quantities of oil continued to rise to surface, but these were emanating from pockets trapped under overhangs, machinery sumps, and the like.

• Day-long search for the bow section resulted in substantial contact on eastern side of shoal. This location not only provided strong sonar echo and return from depth recorder, but also was source of turbulence and oil rising to the surface. Darkness precluded visual investigation, but was planned at earliest opportunity permitted by weather. Friday weather forecast called for 30-knot winds and 10-foot seas. Location marked by salvage float. Request was made for Coast Guard helicopter to assist in relocating area. Possibility of using minesweeper's mine hunting sonar in locating bow section was investigated.

2000 USS RECOVERY requested a helicopter at 0800 4 February to assist in locating point source of oil slick originating approximately 1.25 miles East of ARGO MERCHANT kingpost. CO USS RECOVERY arranged minesweeper assistance. Placement of wreck buoy ASAP 500 yards West of ARGO MERCHANT wreck, while it was still visible, was recommended.

2100 Weather report from USS RECOVERY: 40°56'N, 69°25'W; winds 252°T/22 knots; seas 250°T/1 foot; swells 290°T/3 feet; sea temperature 38°F; cloud cover 10/10 ST; barometer 29.56.

February 4, 1977

0900 Weather report from USS RECOVERY: 41°02.5'N, 69°14'W; winds 307°T/24 kts.; seas 285°T/1 foot; swells 285°T/5 feet; sea temperature 40°F; cloud cover 90 percent; barometer 29.56.

0930 HH3 arrived onscene. O/S weather, overcast, visibility 10 miles, winds 300°T/20 kts., seas 270°T/8 feet.

- 1010 HH3 departed scene and was unable to locate kingposts.
- 1033 From CCGDONE to GRU WOODS HOLE, Info CGC BITTERSWEET:
Fishing Rip Wreck — Retrieve wreck buoy and establish on station ASAP 500 yards West of visible portion of ARGO MERCHANT wreck.
- 1044 MSO Boston (OSC) requested USS RECOVERY to advise and further explain the cargo tanks that were surveyed as part of main hull structure. Needed to know where the major breaks occurred at stern section, midship section, and bow section; also needed to know which cargo tanks had been surveyed and which cargo tanks remained unaccounted for.
- 1407 From CCGDONE to GRU WOODS HOLE, Info CGC BITTERSWEET:
Fishing Rip Wreck — Reset wreck buoy in position 41°01.7'N, 69°26.8'W on or about 5 February, weather permitting. Report by message when action has been completed and include depth of water.
- 1427 HH3 located kingposts at position 41°00.7'N, 69°27.2'W, also located numerous streaks and small pancakes 1-1/2 miles Southeast of kingposts. Found white bell buoy laying on its side at position 41°23.9'N, 70°04.6'W, due icing.
- 1500 • USS RECOVERY attempting to locate bow section.
• Formally discontinued long-range mapping flights, since oil not found in any area except along Southwest part of forecast limits. Two 2- by 2-foot pancakes sighted earlier had dispersed. Long-range flights requested should another major release of oil be noted during short-range flights now being conducted.
- 1532 Coast Guard OCEANO Unit indicated it could not provide trained oil observer after 15 February. Due to MSO Boston operational commitments, MSO was unable to provide trained oil observer for oil observation flights. Requested a trained oil observer from CCGDONE be made available for MSO on or before 15 February. Duration unknown.
- 1540 CGC BITTERSWEET to GRU WOODS HOLE - Fishing Rip Wreck: Request all available recent information on sunken parts of wreck to prevent hazarding of this vessel during establishment of subject buoy. Intend to utilize new 8 x 26 LGB presently onboard and recover and return 9/32 LGB previously used.
- 1800 Weather report from USS RECOVERY: 41°02.0'N, 69°31.0'W; winds 257°T/15 kts.; swells 265°T/3 feet; sea temperature 37°F; cloud cover none; barometer 29.57.
- 1901 USS RECOVERY reported that heavy weather during the morning precluded relocation of wreck. All marker buoys had been carried away by the current. Coast Guard helicopter flew to wreck site, first sighting kingpost at 1215. Reported 2 feet of kingpost protruding from water at intervals. Ship anchored on eastern edge of Rip; boat surveys were conducted, resulting in hard metallic contact in same location as 3 February

contact. Oil rising to surface. Strong currents precluded diving, visibility poor during tidal ebb. Intent was to remain anchored during the night, weather permitting, and resume investigation next day. Full gale predicted to develop PM 5 February and last until late 7 February. Heavy weather from West may make transit to Newport difficult. Request made to arrange port visit, Boston, to ride out weather if necessary. Arrival AM 6 February, departure PM 7 February. Minesweeper and ASW patrol aircraft assets not available until 7 February at the earliest.

- 2014 From USS RECOVERY: Description of diver survey on ARGO MERCHANT stern section was as follows:

Divers descended on port after kingpost. Visibility on incoming flood tide was approximately 40 feet. After-house destroyed to 01 level. Observed deck supports for crew's mess tables. Port side port holes twisted and distorted. Looking down into engine room and pump room, all platforms and ladders were gone. Going down on the main deck, observed tank tops for 10 port and 10 center. Forward of these tanks to approximately tank 7, it appeared to have been completely distorted/destroyed. Tanks 10 port and 10 center were definitely open to the sea. The main body (deck to keel) appeared to be completely buried. In some places the side walls were sticking out of the sand 10 feet; in others, 6 inches. Considerable debris, such as condensers, steam coils, manifold valves, etc., was strewn haphazardly about the area. No concentration of oil noted on bottom or elsewhere with the exception of oil on tank walls. A considerable number of large free-swimming fish have already established residence. In summation, the level of destruction was incredible to those who saw it, and a physical testimony to the forces on this shoal.

February 5, 1977

- 1415 USS RECOVERY requested permission to enter port of Boston 0700 Sunday, 6 February, and requested pierside berth at Coast Guard base (ETA 0800).
- 1505 USS RECOVERY reported ship remained anchored on Rip through the night. Early morning brought calm seas, but driving snow. Divers made two excursions to contact site. Unable to investigate due to 4-knot currents on first trip. Second survey revealed marker had dragged from site. Rapidly building weather forced discontinuation of search and survey. Diver/boat crew endurance extremely limited in extremely cold weather. Proceeded to Boston to avoid gale moving into the area. Intent was to return to Rip area Tuesday morning, weather permitting, to resume search. Expected assistance from ocean minesweepers in bow location on 8 February. For NWS Boston — Requested continuance of special forecast for Fishing Rip area. Forecast needed to permit determination of best time/date to resume operations.
- 1511 Survey flights were cancelled due to weather.
- 1715 USS RECOVERY reported locating object on the bottom which they believe to be the bow section for the following reasons:
- (1) Located approximately 1.5 miles East of stern kingpost which was direction of original drift and in line with last visual sighting;

- (2) Positive metallic return with AST hand-held underwater sonar;
- (3) Positive echo return on chart recording bottom profile; showed large object 25 feet off bottom (60-foot depth);
- (4) Periodically traced dime-size drops of fresh oil to vicinity (oil still has localized rainbow); and
- (5) Surface waters were turbulent with small whirlpools at certain tide angles (inconsistent with surface conditions elsewhere in area).

However, unable to confirm that it was the bow section and destroyed like aft section without visual contact. The following problems contributed to that failure.

- (1) Navigation time — We were unable to quickly and precisely return to the kingpost without helicopter assistance. This reduced the working time in the weather window (USS RECOVERY positively must move off Rip in bad weather).
- (2) Weather — Windows were very short, and cold weather, wind, and high confused seas were hard on both men and equipment, making simple tasks difficult.
- (3) Current — Rotary current never stops. It slowed to approximately 1 knot on flood and ebb for 40 mins. Unable to put down a marker that would stay put in rotary current (with existing onboard gear, have expended all of ship's diving clumps and boat anchors).

Operations this day consisted of AST and Navy personnel diving in snow storm with 1/2-mile visibility and 5-foot seas. Marker had shifted and we observed nothing except hard white sand. Loss of diving window precluded further activities. CO USS RECOVERY arranged for minesweeper and MAD aircraft for following week. If operation continued, plan was to purchase proper marker mooring, etc., in Boston. Recommended USS RECOVERY be outfitted with a good dual-rate autotrack Loran-C receiver and applicable charts to take advantage of repeatability accuracy for our use and any future Coast Guard activities. CGHQ had a commercial receiver with antenna and coupler for Loran-C.

1735 Status of vessel remained the same. USS RECOVERY was enroute Support Center, Boston, Pier 3 Bravo. H3 overflight was scheduled for AM, 6 February.

February 6, 1977

0945 USS RECOVERY was moored at USCG Support Center, Boston, for resupply and minor outfitting.

1427 Helicopter located kingposts at position 41°00.7'N, 69°27.2'W; also located numerous streaks and small pancakes 1-1/2 miles Southeast of kingposts. H3 overflight was scheduled for 0830 on 7 February. USS RECOVERY was scheduled to be back on search and diving operations on 9 February with USN minesweepers.

February 7, 1977

- 1615 In an overflight conducted this date, small wisps of oil less than 5 feet in length were sighted one mile Northeast of kingpost; no other pollution was sighted. H3 overflight was scheduled for 9 February. BTT buoy position at 0429 4 February was 38°15'N, 54°43'W.

February 8, 1977

- 1700 Requested H3 support for USS RECOVERY be onscene at vessel wreck site 0730 9 February to locate the vessel.
- 1705 Cancelled request for forecast limits of oil from Coast Guard OCEANO unit due to no discernible oil being found on long-range overflights and no present threat to U.S. waters or coastline. Notified Commonwealth of Massachusetts regarding the above at 1100 and notified Senator Kennedy's office at 1135. No overflight was conducted this date.

February 9, 1977

- 0100 Weather report from USS RECOVERY: Obv. Time: 0500 9 February; 41°36'N, 69°33'W; winds 293°T/12 kts.; seas 310°T/5 feet; swells 310°T/1 foot; sea temperature 37°F; cloud cover zero; barometer 30.30.
- 0700 USS RECOVERY arrived onscene to continue operations, weather permitting.
- 1945 USS RECOVERY reported being underway for site from Boston 0821. Rendezvous with ocean minesweepers USS DASH and USS DETECTOR effected 0600. All units transited final 5 miles to search area in company. Located kingpost 0700 and planted reference buoy 500 yards East of wreck site. Weather was ideal. Minesweepers began search and almost immediately began obtaining sonar contacts on Rip in area of reference buoy. Anchored and began operating diving boats. P-3 aircraft arrived 0900 and, as requested, began MAD runs on eastern edge of Rip where bow section formerly believed to be. One small disturbance marked by aircraft, but no sonar returns present. Aircraft departed 1105. Minesweepers located two large contacts near last reported visual position of bow, but difficulties encountered in accurately placing buoys on objects. Strong current and poor underwater visibility necessitated that markers be placed almost on top of contacts so divers could investigate. Total of four dives revealed only 10-foot by 4-foot section of hull plating and frames. DETECTOR detached at 1700 for other assigned duties. DASH available until 1600 on 10 February. USS RECOVERY planned to remain anchored through the night with DASH. Diving window 0930-1130 10 February would allow buoys to be moved to objects prior to dive. Continuation of good weather was predicted.
- 2100 Weather report from USS RECOVERY: 41°02'N, 69°26'W; winds 198°T/17 kts.; seas 200°T/5 feet; swells 250°T/2 feet; sea temperature 39; cloud cover; barometer 30.18.

February 10, 1977

1258 From USS RECOVERY — ARGO MERCHANT Final Report:

1. Located and completed verification/survey dive on bow section of ARGO MERCHANT. Bow located where previously detected on eastern side of Rip.
2. Navy minesweeper placed buoy within 10 feet of section. AST and Navy divers commenced joint diving survey at 0927 through 1015. Survey showed bow section upside down in 60 feet of water with forecastle area sanded-in to main deck level. Section had a port list with severe trenching to approximately 80 feet off the down side. (Port and starboard notations are to a normal upright reference; starboard side and decking ripped and torn from forecastle break aft.) The port side walls were not so severely torn, and it was necessary to shovel away sand to look up under main deck. The side walls terminated with torn steel and the main deck was not there. Swam up into a tank on starboard side and noted oil on bulkheads, torn suction lines, etc. Diving visibility was approximately 40 feet and underwater conditions during the window were excellent; i.e., no surge, etc. Dive was terminated due to increasing current and deteriorating sea conditions.
3. Comments and recommendations — AST and Navy agreed that no significant amount of oil remained. However, isolated pockets and clingage* will produce small oil clumps and sheen for a long time. Recommended (a) maintaining security zone; (b) terminating present operations; and (c) returning to scene in May or June for observation purposes and sample collection when conditions are safe. As a final note, there was abundant free-swimming sea life in area and no oil on the bottom.

1630 Phone patch with AST LCDR. Chambers on USS RECOVERY — All tanks accounted for. Center sections surveyed on previous dives along with all bow tanks. No substantial oil left. Bow section located 2700 yards, 120°T from kingpost position.

1750 Plan to continue monitoring beaches and intend to move standby clean-up contractors from Nantucket. Also intend to hold press conference 1300 on 11 February in Boston with CO AST.

February 11, 1977

0900 Coastal Services and Jet Line Services standby Nantucket terminated this date. Beach patrols by CGSTA, Brant Point, no longer required. NWS special weather forecasts Fishing Rip area and special wind forecasts no longer required.

Scheduled overflights by Coast Guard Air Station, Cape Cod, no longer required. Request Air Station, Cape Cod, make overflights of subject area during normal operations, and suggest they be combined with twice-weekly OFP flights.

* Clingage — oil adhering to tank sides, bottom, and deckhead after compartment is emptied of bulk cargo.

Notified Board of Selectmen, Nantucket, that clean-up contractors were terminated this date.

Plan to continue phase-down of operations and reduced information addressees on POLREPS. Plan to continue POLREPS as the situation warrants rather than daily.

- 1001 Diving survey of ARGO MERCHANT wreck completed on 10 February. Services of USS RECOVERY no longer required. Timely response and assignment of USS RECOVERY much appreciated.

For USS DASH and USS DETECTOR — Assistance in locating the bow section of subject wreck much appreciated and considered invaluable in accomplishing the mission.

For USS RECOVERY — Your dedication, seamanship, and well-considered actions onscene made possible the timely accomplishment of the diving survey. Well done.

- 1300 Press conference held.

- 1306 Request Notice to Mariners carry the following information: "Atlantic Strike Team divers survey in area of wreck of ARGO MERCHANT revealed stern section of subject vessel in position 41°02.2'N, 69°27.5'W and scattered debris running 2700 yards along the sea bottom on a line on a bearing of 120°T from subject position to the submerged bow section of subject vessel which rests in approximately 60 feet of water at 41°00.7'N, 69°27.2'W. All mariners take note."

- 1723 Prohibited Zone is no longer deemed necessary due to recent findings and is hereby disestablished.

February 14, 1977

- 1128 U.S. Coast Guard Notice to Mariners, First District, Number 1723-76, was cancelled.

- 1500 Overflight oil survey of ARGO MERCHANT: no pollution sighted.

February 15, 1977

- 1106 Overflights of wreck site were to be conducted in conjunction with USCG Fisheries Patrol.

February 18, 1977

- 1410 CGC BITTERSWEET reported Fishing Rip wreck buoy reestablished in position 41°01.7'N, 69°26.4'W in 78 feet of water. Unable to set in position given due to suspected piece of submerged wreckage marked by a nun buoy No. 4 and a small spherical buoy. The new wreck buoy is 500 yards due West of the wreckage. Recovered old wreck buoy in position 40°57'N, 69°26.8'W.

March 1, 1977

- 1416 Situation remained same as before. All operations were phased down with the exception of overflights by Cape Cod Air Station in conjunction with their normal operations. Samples of oil washed on beaches of Martha's Vineyard tested and found not to emanate from ARGO MERCHANT. Overflights conducted by Coast Guard Air Station, Cape Cod, in area of vessel wreck site since 11 February revealed no pollution. Based on this fact, OSC felt five-day oil pollution outlook from Coast Guard OCEANO Unit was no longer necessary.

March 3, 1977

- 1520 ARGO MERCHANT overflight; no pollution sighted.

March 7, 1977

- 1502 ARGO MERCHANT overflight; two circular, moderate oil sheens, approximately 6 feet in diameter, were located in the vicinity of the ARGO MERCHANT.

March 8, 1977

- 1500 HU16E sighted oil sheen on 7 March near ARGO MERCHANT. Flight located two sheens about 300-400 yards South of wreck buoy. One pass was made but source could not be determined. Did not sight the kingpost.

Weather: winds 0.75 kt., seas 1 foot, overcast, calm. Pilot stated that if sea had been slightly rougher, he would not have sighted the sheen as it would have been broken up.

March 9, 1977

- 1554 Overflight oil survey; no pollution sighted.

March 11, 1977

- 1655 ARGO MERCHANT overflight; no pollution sighted.

March 15, 1977

- 1055 Report from R&D Center: Preliminary analysis of water column samples collected by the CGC EVERGREEN, BITTERSWEET, and VIGILANT during December 1976 indicated petroleum oil concentrations as high as 250 ppb from subsurface to 10-meter depth samples. The petroleum oil found in these samples was either the light petroleum fraction of the residual No. 6 fuel oil, or the cutting stock used to blend the residual Venezuelan fuel oil. Analysis of water samples collected by the R/V ENDEAVOR during January and February 1977 indicated no significant petroleum oil concentration in the affected area.

Presence of the ARGO MERCHANT oil was found in sediment samples collected Southwest of the bow section during February 1977. Oil was surmised to have entered the sediment through the mechanical movement of the bow and stern sections along the bottom.

March 19, 1977

1457 ARGO MERCHANT overflight; no pollution sighted.

June 15, 1977

POLREP 80 and final report concerning major oil spill of ARGO MERCHANT.

From COGARD MSO, Boston, (OSC) to CCGDONE et al.

CO AST recommended that diving operations be continued May/June 1977 for observation of the wreck and oil sample collection. OSC did not concur with this recommendation in that funding was not within purview of use of pollution fund.

On 22 March 1977, OSC requested comment and guidance concerning continuation of diving operations from RRT, and further recommended that determination of RRT be referred to NRT for comment due to high interest of news media and scientific community.

On 19 May 1977, both RRT and NRT supported the OSC concerning future diving operations and recommended that:

1. Contingency Plan be developed to protect shoreline in event oil was emitted from wreck in sufficient quantity to reach shore; and
2. Routine Coast Guard flights transiting close to or over the area be directed to pay particular attention to the scene of the wreck so as to provide early warning should oil be emitted in sufficient quantity to reach shore.

On 2 June 1977, Contingency Plan was developed as recommended by RRT and NRT and placed on file at MSO, Boston.

On 6 June 1977, COGARD Air Station, Cape Cod, adopted plan for overflights to be held in conjunction with routine (OFP) flights. Approximately 10 flights per month are scheduled over area.

Last sighting of oil sheen in wreck vicinity was made on 7 March 1977, but it was not definitely determined to be oil from the ARGO MERCHANT.

Case closed.

4. KEY MARINE SALVAGE PERSONNEL AND RESPONSE EQUIPMENT ASSIGNED TO ARGO MERCHANT GROUNDING AND SUBSEQUENT OIL SPILL

4.1 KEY PERSONNEL

The following key marine personnel were directly involved in all marine activities:

Rear Admiral James P. Stewart — Commander, First Coast Guard District
Captain Walter Folger, USCG — Chairman, Regional Response Team
Captain Lynn Hein, USCG — Commanding Officer, Marine Safety Office Boston,
Pre-Designated On-Scene Coordinator
Commander D.A. Calicchio, USCG — Exec. Officer, Marine Safety Office, Boston
Commander Chas. Morgan — USCG Oceanographic Unit, Washington, D.C.
Commander F.D. Duff, USN — Supervisor of Salvage
Lt. Commander Barry Chambers, USCG — Commander Atlantic Strike Team
Lt. Commander Roger Cowley, USCG — Deputy On-Scene Coordinator
Captain Alfred Kirchoff — Murphy Pacific Salvage Co., Salvage Master
Lt. H.R. Williams, USCG — Public Affairs Officer, First District, USCG
Dr. James Mattson — NOAA/USCG — Spilled Oil Research Team
Philip Ripa — Mass. Dept. of Water Pollution Control
Mr. William Tripp — EPA
All personnel, Coast Guard Air Station, Cape Cod, under the command of Capt. G.T. Seaman.

4.2 ACCUMULATED RESPONSE EQUIPMENT LISTING

The equipment listed in this report section was deployed to the spill site or placed on a standby basis.

JET-LINE SERVICES

(Commercial clean-up contractor)

Nantucket

Ten 16-foot boats
Twenty motors
One commercial van
Three 40-foot box trailers
Six thousand feet of 36-inch boom with anchors

Absorbents
Hand tools
Utility van life-saving equipment, etc.
One truck

Woods Hole

One tractor trailer
Oil snare
Absorbent No. 6
One 40-foot box trailer and gear

Additional equipment was available (on an as needed basis) at:

A. Home office at Stoughton, Mass. (1-hour response)

B. Subcontracted:

1. Local contract for diking,
2. Two local boats on standby,
3. 100 personnel from island.

Personnel:

Five trained personnel available on-scene

Alerted by Coast Guard A.M. 15 December 1976:

Jet-Line Services on-scene 15 Dec. 1976 at Cape Cod Air Station. Hired by Coast Guard at 1900, 21 Dec. 1976, to deploy equipment on Nantucket Island.

COASTAL SERVICES

(Commercial clean-up contractor)

Nantucket Island

Fifty-five hundred feet of 36-inch metropolitan boom
Two box trailers
One flatbed
Two tank trucks
One tractor
Two hail pumps
Five-hundred feet of 1 1/4-inch discharge hose
Forty-five shovels
Two boxes of rain gear
Thirty pitchforks
Thirty racks
Four personnel

Woods Hole

Fifteen-hundred feet of 36-inch coastal booms
Three-hundred 18-inch coastal booms
Three-hundred and fifty 18-inch metropolitan booms
One-hundred and eighty sausage booms (10-foot sections)
One-thousand and forty coastal packs
One spill trailer
Assorted tools
One 2-inch suction hose
Three boats

Additional equipment available as needed from:

- A. Home office, Braintree, Mass. (1-hour response)
- B. Subcontractors

Personnel:

Four trained personnel available on-scene.

Alerted same time as Jet Line Services; Hired 21 Dec. 1977 also.

CANNON ENGINEERING CORPORATION

Equipment List

Four pressure vacuum trailer trucks, plus 10 as needed
Twelve pumps — air/electric
Three air compressors
Five tank trucks — 5000, 8000, 10,000 gal.
One industrial tractor
Two trailers-equipment-box low-bed
Four boats
One water blaster
Five-hundred feet of 36- and 13-inch booms
Grefco booms
Grefco pillow bags
Sea Serpent II
Petroleum — trap-bags 5 pack
Conwed blanket-booms-pads
Fifty-inch hauling barge, water-proof vessel, plus 10,000-gal. tank
Fifty-six LCN barges
Two truck — spill trailers, Chatham area
One truck — spill trailers, Orleans area

Cannons placed on alert A.M., 15 Dec. 1976, and hired by Coast Guard at 1900, 25 Dec. 1976, to deploy equipment at Chatham and Orleans.

RESOURCES

Vessels:

CG Units

1. CGC VIGILANT
2. CGC SHERMAN
3. CGC BITTERSWEET
4. CGC EVERGREEN

Research Vessels

1. R/V DELAWARE II
2. R/V OCEANUS

Released

December 23, 1976
December 21, 1976

Commercial

- | | |
|--|-------------------|
| 1. Tug SHEILA MORAN | December 22, 1976 |
| 2. Tug MOIRA MORAN | December 22, 1976 |
| 3. Tug MARJORIE B. McALLISTER | December 22, 1976 |
| 4. Tug CURB | December 26, 1976 |
| 5. CALICO JACK
(alerted 16 Dec. 1976) | December 16, 1976 |
| 6. Barge NEPCO 140 | December 22, 1976 |
| 7. Barge NEW JERSEY | December 22, 1976 |

National Strike Force:

Personnel

Atlantic Strike Team — maximum assigned personnel 23

Gulf Strike Team — maximum assigned personnel 10

Equipment

Five ADAPTS pumping systems (two lost on ARGO MERCHANT)

One command post Trailer with five insulated phone lines

One trailerized communications center (TCC)

Five boxes High Seas skimmers

One Lockheed skimmer

Dive equipment

Public Affairs Trailer with four installed phone lines.

Coast Guard Aircraft — Air Station Cape Cod

Three HH3 helicopters

Four H52 helicopters

Three HU16E albatrosses

CGAS Elizabeth City, N.C.

Three — C130

Army Equipment

One C-141

Two CH54 Skycrane helicopters

Two UH-1 helicopters

Five 5-ton tractors

Four 12-ton trailers

One low-bed trailer

One 1/2-ton jeep

One 5-ton wrecker

One 500-gal. water trailer

Airforce Equipment

One C-141

Air National Guard

Two UH-1's

Crane Service

Fork Lifts

Lowboys

De-icing Equipment

Aviation Fuel Trucks

Hangar Space for A/C

Navy

Four Marco Mark V skimmers

Four 30-kW generators

Four light towers

Two beach gear legs

One reel 5/8" x 1200' wire rope

Seven exposure suits

Two boom vans

One boom roller

Two 600 CFM air compressors

One 2000 foot, 1 1/4 inch air hose

Two hot tap kits

Four 125-CFM air compressors

Two 600-CFM air compressors

One 2000-foot, 1 1/4-inch air hose

Three 55-cub. ft. volume tanks

AD-A062 028

COAST GUARD BOSTON MA MARINE SAFETY OFFICE

F/G 13/2

THE ARGO MERCHANT OIL SPILL ON-SCENE COORDINATOR'S REPORT. (U)

DEC 77

UNCLASSIFIED

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2 OF 2
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END
DATE
FILMED
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DDC

Murphy Pacific — Under Contract to Navy at direction of OSC.

One 450-hp steam generator
Two Framo pumps
One 4-leg mooring system
Four ADAPTS pumping systems

5. SPILL RESPONSE ACTIONS AND ALTERNATIVES

5.1 SPILL RESPONSE ACTIONS

The initial objective of the response action was to lighten the stricken tanker to regain buoyancy, and to tow her to a suitable repair facility. A water pumping procedure was first attempted since the available pumping systems were best suited for this action. No pumps were readily available for offloading the heavy fuel oil cargo and no barges were immediately available for a lightering action. Additionally, as the oil cargo cooled with each passing hour, the possibility of transferring 7.7 million gallons of oil into barges, or a number of small coastal tankers, decreased accordingly. Weather conditions after the first grounding worsened until a full-scale "Northeaster" prevented any response action other than to remove the crew members from the stricken ship and stand by and observe. Support vessels left to find safe anchorage and all aircraft were grounded. Barge tows could not be conducted under conditions of sea state 5. By 18 December the vessel had leaked an estimated 1.5 million gallons of oil with the slick moving in a Northwest direction (away from the shorelines) for a distance of 7.5 miles. On 19 December the ARGO MERCHANT was settling at the stern at a time when fenders were rigged to permit an offload action into barges. On 21 December the vessel split aft of the after kingpost, specifically at tank 7 and at tank 4 on 22 December.

During this period three commercial oil spill clean-up companies were on standby and readily available to deploy oil spill containment booms and recovery skimmers. Unfortunately, none of the equipment could be used because of the strong wind and heavy wave action experienced during the critical days between 16 December and the break-up of the vessel on 21 December.

• Master Plan for Offloading Oil from ARGO MERCHANT

The Master Plan for offloading oil cargo from the ARGO MERCHANT is described below and delineated in Figure 17. A steam boiler was welded to the open deck of the supply ship CALICO JACK. The vessel was also to be equipped with a large, heavy-duty, Framo hydraulic pump system. Steam generated in the boiler was to be transferred from the CALICO JACK through a flexible steam line connected to a portable steam coil inserted in ARGO MERCHANT's center tank 4 (the tanker had portable coils aboard at the time of the grounding). Ultimately the heated oil was to be transferred from ARGO MERCHANT's center tank No. 4 by FRAMO pump system into either of two lightering barges (the on-board FRAMO pump obtaining power from the prime mover on the CALICO JACK).

During the cargo transfer the exhaust steam from the heating coils was to be directed into other cargo tanks to raise the temperature of the oil to a desired level for transfer pumping. Using ADAPTS pumps the oil was to be transferred from the various cargo tanks into center tank No. 4 for further transfer into the lightering barges. In this manner the entire cargo could have been offloaded and transferred to an onshore reception area in two loadings and trips of the lightering barges. The equipment was being assembled when adverse weather conditions causing the break-up of the ARGO MERCHANT aborted the salvage plan.

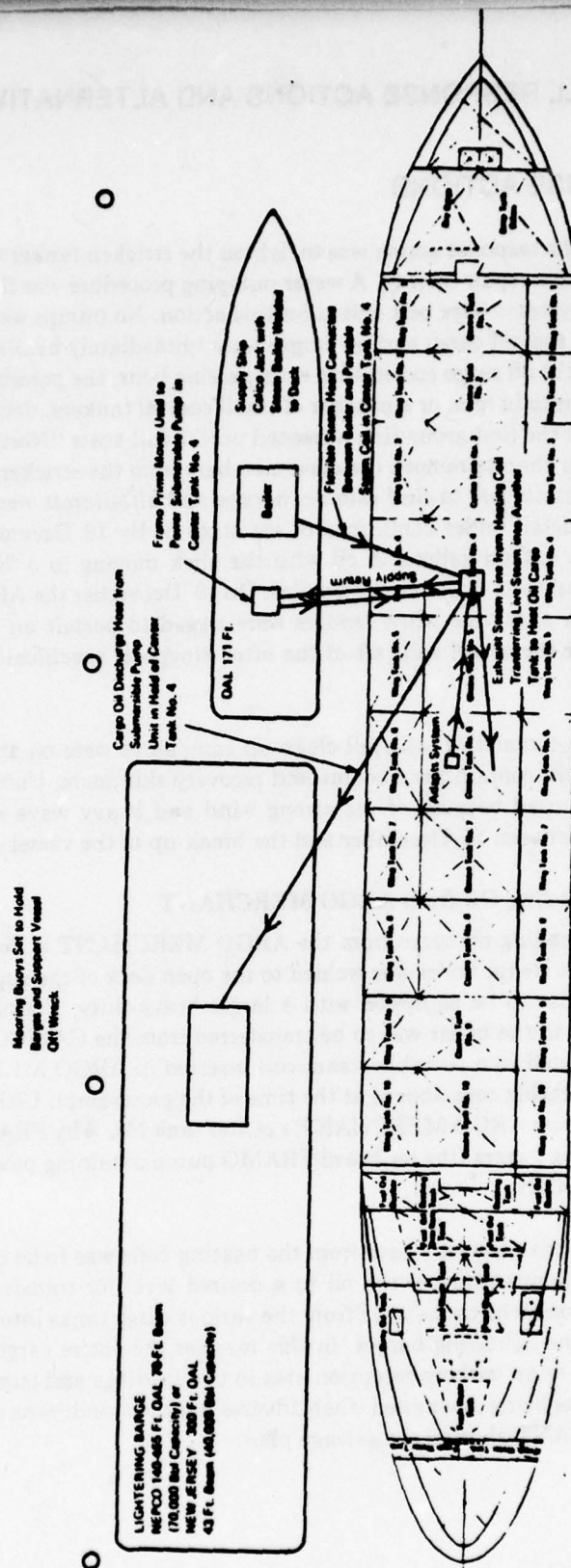


FIGURE 17 PROPOSED METHOD OF TRANSFERRING OIL CARGO FROM ARGO MERCHANT

• **Alternate Plans for Offloading Cargo from Bow Section of
ARGO MERCHANT**

Some of the plans considered for offloading the cargo from the bow section included the following:

Plan 1 — Sink ship in place and recover oil under controlled conditions. Refloat later by injecting air under pressure, or abandon hull in place.

Plan 2 — Remove oil from No. 4 tank and pump to cargo hold. Regain buoyancy by injecting air under pressure, then tow to deep water and sink. An alternative to this would entail blowing oil from tank No. 4 to the sea.

Plan 3 — Remove all oil from forward part of tanker, regain buoyancy by blowing, tow to sea, and sink or scrap.

Plan 4 — Remove oil from No. 4 tank. Regain buoyancy by air injection. Tow to sheltered waters and remove remains of oil cargo. Dispose of forebody by sinking or scrapping.

None of the four plans was implemented due to adverse weather and the final break-up of the tanker.;

Burning in-place was given full consideration but it was not technically or physically feasible. At least 10 percent of the deck plating of each tank would have had to be removed to gain sufficient oxygen to support combustion. As the cargo burned down, it would then require removal of hull plating (est. 15 to 20 percent) to permit air entry and the maintenance of combustion. Even if the cutting and removing of hull steel was physically possible, entry of seawater would have extinguished the fire. Experiments are still being conducted by the US Navy, EPA, and USCG on this problem.

Strategic bombing was evaluated. This plan was ultimately abandoned since vessel salvage was given first consideration, and, following the break-up of the vessel, the oil escaped from the hull, precluding any need to bomb an empty hull. It was necessary, however, to release entrapped air from the separated hull section with shell fire to prevent it from dragging across the bottom and becoming a hazard to navigation. Naturally, the use of dispersants and emulsifiers was evaluated at length. The use of such chemicals is rigidly controlled by the US/EPA, and it was decided that this action might increase, rather than mitigate, the environmental damage, since the casualty occurred near some of the world's prime fishing grounds.

Attempts to ignite and burn the spill on the surface of the water were made, but proved to be unsuccessful. The wicking agent needed to maintain combustion could not be spread effectively due to high winds and wave action. As a result, ignition could not be maintained long enough to gain an effective burning action.

Numerous suggestions were received by the RRT and the OSC from outside experts and the general public. Each suggestion was given full consideration and it is worthy of mention that in some cases pressure was exerted on the OSC to introduce the recommended action. Some typical examples follow:

1. "Use surplus USAF liquid oxygen tanks. Create a massive high-intensity fire within the oil spill by dropping full tanks in and around spill, exploding tanks."
2. "Pump Hi-test gasoline under the spill, gasoline will stay under the oil, let it gel with the oil. Ignite the gelled mixture with dynamite."
3. "Strew thousands of bales of hay on the spilled oil to hold it together."
4. "Use dispersants."
5. "Drop a large rowboat filled with lumber and soaked with kerosene, into the center of the oil spill and set it afire."
6. "Use microbial degradation system."
7. "Freeze oil with CO₂."
8. "Wrap vessel in cheese cloth and tow away."
9. "Use GLOMAR EXPLORER."
10. "Bomb the ship and set it on fire."
11. "Use CONTAX, sodium — to be applied to spill in projectile to burn the oil."
12. "Use Equal (ECOL) Plus dispersant."
13. "Ceiling pumping, partial freezing and offloading of the structure."
14. "Burn cargo."

Technical, environmental, offshore, and supply conditions were such that none of the suggestions could be implemented before the vessel broke up and released her No. 6 oil cargo. Once it was established that weather conditions were, in fact, protecting the U.S. coastline (Figure 18) and that no other remedial action could be introduced, natural dispersal at sea was considered by all concerned to be the best recourse.

5.2 RESPONSE ACTION FOR WILDLIFE PROTECTION

5.2.1 Procedures

On 21 December 1976, representatives of the Commonwealth of Massachusetts Division of Water Pollution Control, the US/EPA, and the U.S. Fish and Wildlife Service met to develop a contingency plan for wildlife protection in the event the spilled oil reached the Massachusetts islands and main coastline.

Per the National Contingency Plan, DOI Federal Fish and Wildlife personnel assumed responsibility for this response action, utilizing both State personnel and civilian volunteers to cleanse and otherwise aid oil-contaminated wild fowl. Petty Officer Keith Darby was the bird handling specialist from the Atlantic Strike Team involved in this project.

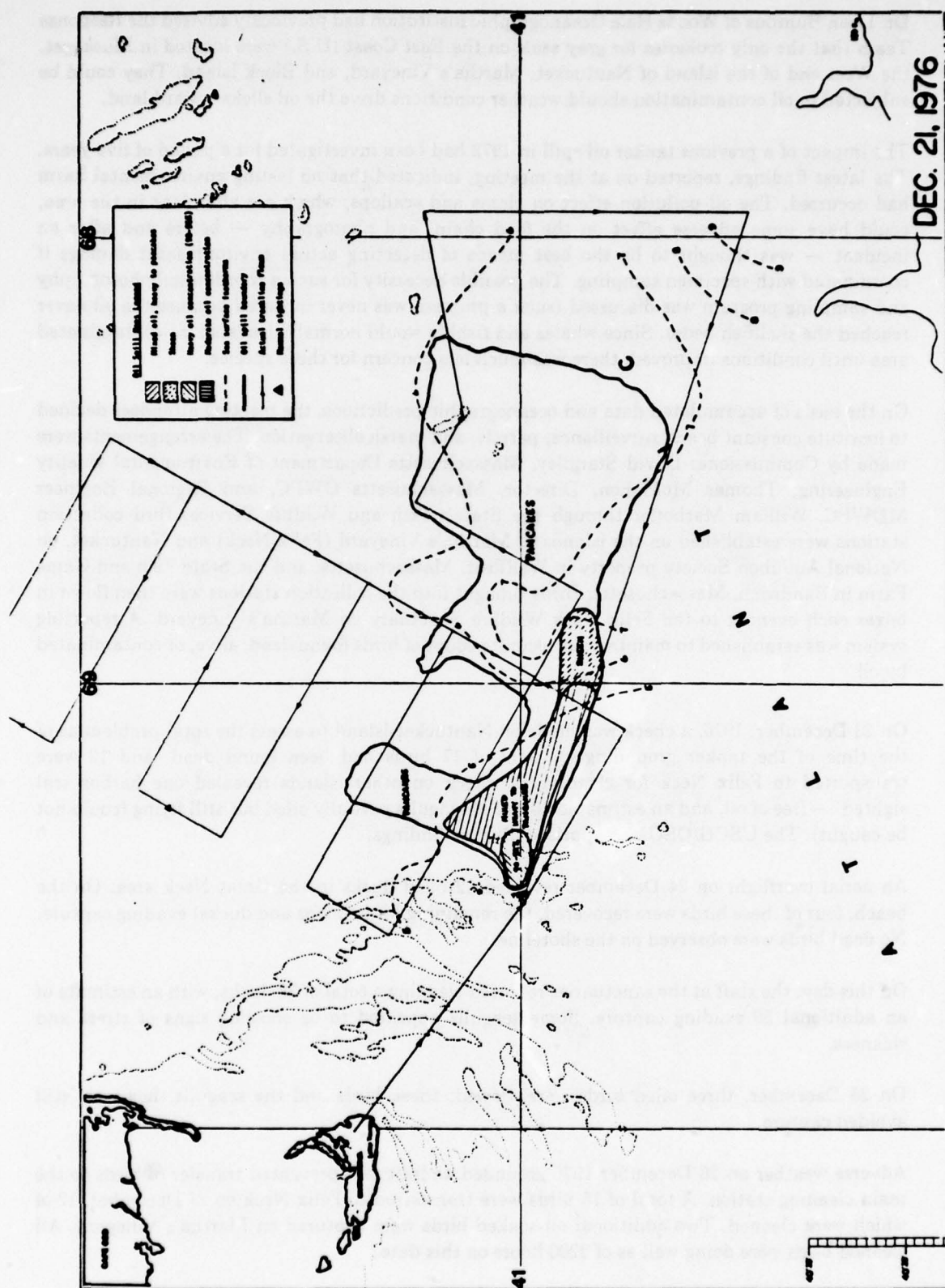


FIGURE 18 TRAJECTORY OF OIL SLICK FOLLOWING BREAK-UP OF ARGO MERCHANT

Dr. Dean Bumpus of Woods Hole Oceanographic Institution had previously advised the Response Team that the only rookeries for gray seals on the East Coast (U.S.) were located in Muskeget, the West end of the island of Nantucket, Martha's Vineyard, and Block Island. They could be subjected to oil contamination should weather conditions drive the oil slicks toward land.

The impact of a previous tanker oil spill in 1972 had been investigated for a period of five years. The latest findings, reported on at the meeting, indicated that no lasting environmental harm had occurred. The oil pollution effect on clams and scallops, which are abundant in the area, could have some adverse effect on the food chain, and photography — before and after an incident — was thought to be the best means of detecting actual environmental damage if coordinated with specimen sampling. The possible necessity for such a coordinated photography and sampling program was discussed (such a program was never initiated because the oil never reached the shellfish beds). Since whales and fishlife would normally leave an oil-contaminated area until conditions improved, there was much less concern for these species.

On the basis of accumulated data and oceanographic predictions, the meeting attendees decided to institute constant beach surveillance, patrols, and marsh observation. The arrangements were made by Commissioner David Standley, Massachusetts Department of Environmental Quality Engineering; Thomas McMahon, Director, Massachusetts DWPC, and Regional Engineer MDWPC, William Marhoffer through the State's Fish and Wildlife Service. Bird collection stations were established on the islands of Martha's Vineyard (Felix Neck) and Nantucket, on National Audubon Society property in Wellfleet, Massachusetts, and the State Fish and Game Farm in Sandwich, Massachusetts. Birds brought into the collection stations were then flown in boxes each evening to the Felix Neck Wildlife Sanctuary on Martha's Vineyard. A reporting system was established to maintain an accurate count of birds found dead, alive, or contaminated by oil.

On 23 December, 1976, a check was made on Nantucket Island to assess the total problem as of the time of the tanker grounding. A total of 17 birds had been found dead, and 12 were transported to Felix Neck for cleaning. A check on other islands revealed one harbor seal sighted — free of oil, and an estimated 50 to 100 seagulls partially oiled but still flying (could not be caught). The USCG/OSC was apprised of these findings.

An aerial overflight on 24 December revealed 12 oiled ducks in the Great Neck area. On the beach, four of these birds were recovered, the remaining birds (loons and ducks) evading capture. No dead birds were observed on the shoreline.

On this day, the staff at the sanctuaries reported cleaning a total of 36 ducks, with an estimate of an additional 50 evading capture. Some seagulls appeared to be showing signs of stress and sickness.

On 25 December, three oiled birds were viewed; these birds and the seagulls, however, still avoided capture.

Adverse weather on 26 December 1976 grounded aircraft and prevented transfer of birds to the main cleaning station. A total of 15 birds were transferred to Felix Neck on 27 December, 12 of which were cleaned. Two additional oil-soaked birds were captured on Martha's Vineyard. All cleaned birds were doing well as of 2200 hours on this date.

On 28 December, five additional oily birds were shipped into Felix Neck:

The Nantucket Island collection station reported having received 109 birds and that 62 birds were dead upon arrival. By 31 December, a total of 47 out of the 109 birds had been shipped to Felix Neck for cleaning. On this day, Felix Neck reported having 25 ducks cleaned and thriving. Total recovery count for the day: 1 live and 16 dead birds.

On 1 January 1977, the staff on Nantucket reported a total of 132 birds collected, 53 alive and 79 DOA. The total of oil-contaminated birds was 114. Six live birds were ready for shipment to Felix Neck where only 20 live birds were in retention in the rehabilitation center. Total collection for this day was 6 alive and 16 dead birds.

On 2 January, the Nantucket bird count reached 143, 55 alive and 88 dead. At Felix Neck 62 birds had been received: 27 alive and 35 dead. These totals were increased by 2 alive and 10 dead birds collected during the same day.

The bird rehabilitation response action continued through 6 January, with the total increased by an additional 20 dead and 32 live birds collected during 3 and 6 January.

In summation, the actions of governmental conservation personnel and volunteers from the public sector resulted in the collection of 408 birds of varied species, 262 being dead and 146 alive. By comparison with other bird cleaning actions, the live and treated average in excess of 35 percent is indicative of a successful response action. The averages in other major oil spills have rarely exceeded an average of 20 percent of collected birds saved.

The total cost of this response effort was as follows:

U.S. Department of Interior Fish and Wildlife Service	\$ 1,507.37
Commonwealth of Massachusetts Department of Fisheries and Wildlife	\$12,000.00
Total	\$13,507.37

On the basis of expenditures the cost of saving each bird was in the vicinity of \$92.51.

5.2.2 Bird Cleaning Techniques*

5.2.2.1 Edit Process

One of the reasons for having a high (35%) survival rate can be attributed to the fact that the birds were closely "edited" upon arrival at the main cleaning station at Felix Neck, Martha's Vineyard, Mass. Birds that obviously had no chance of survival were not treated. They were in fact promptly put out of their misery. Birds having a good to better chance of survival were selected for the bathing process.

* Information provided by Augustus Ben David II, Director, Felix Neck Wildlife Trust, Inc.

5.2.2.2 Bathing Process

A detergent, Polycomplex All, was selected for the cleaning process based on past experience with the material. Three tubs were used for bathing, each containing 8 gallons of lukewarm water. Polycomplex All was added to each tub using a 1-lb coffee can as the measuring device — a measurement of 1 ½ cans was mixed in each tub. The times the water was changed depended on the extent of oil on the birds being bathed. Normally 10 to 20 birds could be individually washed in the same tub of water. Each washing produced an increase in cleanliness of the plumage. The birds were then rinsed under a faucet of lukewarm water. The cleaning action resulted in 99% of the natural and unnatural oil being removed from the birds. Once cleaned of detergent the soaking wet birds were lightly towel-dried for one minute. At all times the birds were under great emotional stress.

5.2.2.3 Drying Process

The wet birds were then placed into drying units which consisted of plywood compartments heated with infrared bulbs which were adjusted by elevation to maintain a temperature of around 82°F. The units were bedded with crushed sugar cane stock (Seroval) due to its high absorption qualities. People were kept away from the birds to reduce their stress; they were not fed and remained under the heat lamps for 7 to 8 hours.

5.2.2.4 Rehabilitation Center

A waterfowl rearing building was used for the rehabilitation process. This was divided into two parts with a dry unit on one side adjacent to a swimming pool section. General air temperature on the pool side was maintained at 68°F and the dry side was heated by infrared lamps to 87°F. In this area the soaking wet birds would start to preen themselves which would activate their natural oil glands and return the feathers into place. The rehabilitation period was a variable factor depending on the breed of bird. Eider ducks would return to near normal in four days and be fully water repellant. Alcids required 7 to 12 days to gain full water repellency. During this rehabilitation process ducks were fed high protein dog food. The waterfowl were fed Coplin (a small fish). Once good body weight was obtained, the birds were transported to a bay on the ocean and released.

5.3 OIL TRAJECTORY MAPPING

A number of organizations conducted modeling techniques to determine the path of travel of the spilled oil. CDR. Charles Morgan, an oceanographer who was assigned to the OSC Staff from the USCG Oceanographic Unit, played a principal role in feeding data from various models into the operation for on-scene decision-making. CDR. Morgan received information from the USCG R&D Center, NOAA's Center for Experiment Design and Data Analysis (CEDDA), the U.S. Geological Survey, and the University of Rhode Island. Modeling efforts included "forecast" trajectories based on predicted or actual wind and current forces, as well as "risk" trajectories which used climatological or historical wind and current data.

All the models used incorporated vector addition of the forces that moved the oil, including winds, tides, and semipermanent currents. In general differences in the outputs of the various models were attributable to: (1) different forces of winds, whether measured, forecasted, or climatological; (2) different sources of current data; and (3) differences in how wind drift, both surface water and oil/water differential, was included.

All models predicted that the surface slicks would move seaward, away from the U.S. coastline, under the influence of prevailing westerly winds. This general conclusion had considerable bearing on response actions and contingency planning.

In summary, the modeling efforts of the USCG can be described as follows: The vector effects of wind currents, tidal currents, sea currents (mean and residual), and oil leeway were summed to determine oil movement possibilities. Based on 24-hour weather forecasts from the National Weather Service in Boston, the oil movement forecast was made at local noon each day. The summary was based on the following inputs:

- Initial position of observed oil positions at 1300 hours on the previous day,
- Observed winds up to the time of movement forecast,
- Forecast of wind conditions up to 1300 hours for the following day,
- Tidal currents, and
- Wind currents.

The U.S. Coast Guard Oceanographic unit was actually tasked with two predictive assignments which included: (1) the probability of oil leaking from the ARGO MERCHANT washing ashore within a few days of leaking; and (2) the ultimate dispersal of the oil. The probability model for Task 1 was developed by Messrs. Lissauer, Welsh, and Hufford (USCG R&D Center) and was originally presented in a draft paper, dated 27 May 1976. The probability of oil recently released from the wreck reaching shore was equated to the probability (determined from a wind rose) of the wind blowing toward shore from any point on a locus approximately 3 by 18 nm, with the major axis oriented 030°-210°T and centered on the wreck site.

The wind data used were taken from the U.S. Navy Summary of Synoptic Meteorological Observations for the area shown in Figure 19. These observations were made by ships within the area during a 112-year period. The probabilities determined by this method were undoubtedly higher than reality, because the model assumed any oil leaked during an onshore wind would reach the shore. Such was not the case because of the distance between the wreck and the shore. Statistics on the duration of winds in the area were not readily available. Thus no quantitative evaluation could be made as to how much the model overestimated probabilities. Qualitatively the overestimation was probably high. This view is supported by the relative brevity of East to South Southeast wind episodes, and by the fact that there was no oil ashore at the time of the modeling, in spite of a predicted approximately 11% probability of there being some in December 1976 or January 1977.

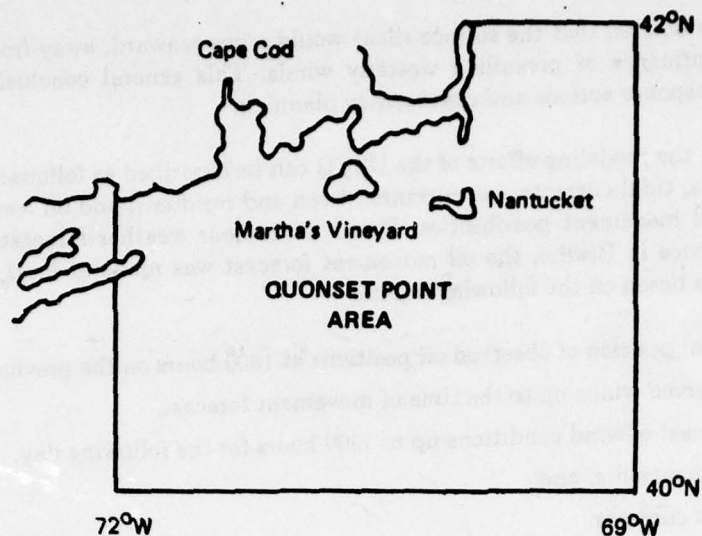


Figure 19 AREA OF WIND DATA USED IN TRAJECTORY MODEL

The predicated probability of released oil from the ARGO MERCHANT reaching Nantucket and Cape Cod, according to the model, is indicated in Table I. The values in Table I can be compared with independently obtained estimates described below.

TABLE I

**MAXIMUM PROBABILITY OF RECENTLY RELEASED OIL FROM
ARGO MERCHANT REACHING LOCALITY INDICATED**

	Nantucket	Cape Cod	Joint
January	8.4	7.1	10.7
February	9.3	7.8	11.5
March	11.6	9.6	14.6
April	13.3	10.8	16.7
May	14.0	12.1	18.0
June	10.8	9.8	14.9
July	11.0	10.1	14.5
August	11.2	9.2	14.7
September	13.7	9.9	16.8
October	11.7	8.5	14.3
November	11.5	9.5	14.5
December	8.2	6.8	10.5

On 29 and 30 December 1976 at the request of the On-Scene Coordinator, the NOAA Center for Experiment Design and Data Analysis (CEDDA) made probability simulations of the movement of oil from the ARGO MERCHANT. (The technique used is described in Appendix F of a NOAA Report, "Analysis of the Risk of Damage to the States of Florida and Louisiana from the Loop Inc.-proposed Deep-water Port.") For the ARGO MERCHANT case, four runs were made, one for December, January, and February and one for April, May, and June. Each season consisted of a wind-effect-only run (3% of wind, 15 degrees to the right of wind), and a wind-effect-plus-a-"worst case"-seas-current run (0.25 kt at 270°T). (Rough copies of the probability maps were retained by the On-Scene Coordinator.) Since the work was based on 15 years of observed sequential wind observations at Nantucket Light Vessel, it included the effect of wind duration. Table II compares the results of this technique, for the periods run, with those shown in Table I. The possibilities, using wind effect only, were roughly comparable, and were 15% or less.

TABLE II
COMPARISON OF PROBABILITIES BY VARIOUS TECHNIQUES

Average Period	Nantucket		
	Wind Rose	Bishop and Godcheaux	
	Wind current and leeway only	Wind current and leeway only	Wind current, leeway and sea current
December/January/February	9%	5%	5-10%
April/May/June	13%	1%	20-30%

The use of sea current values from Atlases of coastal sea currents included an indeterminate wind effect and thus tended to add the wind in twice. It was decided that more precise runs on the probability of recently leaked oil washing ashore would give a false sense of confidence, not supportable by either the physical modeling or the data inputs.

In modeling the movement of oil on the shelf, several points of coastal circulation were kept in mind. First, the great bulk of the oil spilled from the ARGO MERCHANT had moved Southeast off the shelf and into the Gulf Stream or its associated eddies and was meandering in the slope water region. This was substantiated by oil tracking flights and predictive modeling. There were no confirmed reports of ARGO MERCHANT oil outside the recently predicted limits. It was, therefore, unlikely that the bulk of the oil would return to U.S. coastal waters. Second, there was the possibility of minor slicks being outside the known limits and in shelf waters.

Because of the complex interaction of winds and various currents, it was not impossible that small amounts of oil or tar balls from the ARGO MERCHANT could come ashore anywhere from Nova Scotia to Florida during the next two years. Third, although it was not definitely established, it appeared that the intermediate fate of the ARGO MERCHANT No. 6 oil in the ocean was to form pancakes on the order of feet in diameter and inches in thickness. A thin oil film appeared to both trail from the pancakes and be blown by the wind ahead of the pancakes. In smooth weather this film or sheen extended for hundreds to thousands of feet in definite patterns. However, many of the film or sheen areas were not associated with pancakes. The film or sheen areas were reduced in heavy weather. It seemed that these films were not a fractionating process,

but that No. 6 oil was only spreading. Such spreading accelerated the process of evaporation, particularly of the lower molecular weight components. The ultimate fate of the oil probably involved mechanical breakup into tar balls. The time frame for this was uncertain. There was no evidence of the oil sinking.

Using a generally accepted picture of shelf circulation from the American Geographic Society Atlas, "Surface Circulation on the Continental Shelf Off Eastern North America between Newfoundland and Florida" by Bumpus and Lauzier, shelf circulation speeds were estimated in the order of 2 to 3 nm/day. Wind currents and oil leeway were superimposed on this general circulation.

West of Nantucket Shoals, oil on the surface waters of the shelf not blown out into the slope water was expected to flow generally in a southwesterly direction parallel to the shore. The complete path from Nantucket Shoals to Cape Hatteras (approximately 500 nm) could be expected to take on the order of 5 to 9 months. Thus, oil spilled in December 1976 could be expected to arrive in the Hatteras area from April 1977 to August 1977. At Hatteras most of the shelf water recirculates into the Gulf Stream, although some might be expected to reach south of Hatteras. Along the outer edge of the shelf there is a general offshore flow transporting surface water into the slope water between the shelf and the Gulf Stream. The slope water area is transited by several 60-mile-diameter eddies each year. These eddies contribute to shelf/slope water exchange. There are several areas along the coast where there is a mean onshore flow which increases the possibility of oil transport shoreward. These areas are located Southeast of Block Island Sound in spring, summer, and winter; on the Northeast shore of New Jersey in all seasons; near Delaware Bay in fall and winter; and near Chesapeake Bay in the summer and fall.

In the vicinity of the wreck site, the mean circulation appeared to be dominated by local wind effects. Thus, the oil tended to be blown out seaward. However, on the North side of Georges Bank there was a more definite circulation pattern. There was a clockwise gyre around the North, East, and part of the South side of the Bank. In Northwest Channel, and East of the channel, there was an inflow into the Gulf of Maine. Oil going on the North side of Georges Bank would probably tend to eventually move offshore on the East side of the Bank, unless it were blown eastward into the stream that flows into the Gulf of Maine. Once in the Gulf of Maine, the oil would probably tend to follow the general counterclockwise circulation there, modified by local winds, and then flow into the Bay of Fundy on its South shore. Oil in the Gulf of Maine circulation would probably tend to exit from the Gulf in a southward flow along Cape Cod and Nantucket, and then move in a general southwesterly drift or in the offshore flow along the East side of Georges Bank.

Another aspect of the movement of oil away from the ARGO MERCHANT wreck was the possibility that some of the oil would, due to interaction with suspended sediments, sink to the bottom.

Along the western side of the Gulf of Maine the drifts next to the coast tend to flow directly ashore, whereas farther offshore the drift is more nearly parallel with the coast in a westerly direction. A line of divergence occurs at Northeast Channel with northerly drifts North and East of the channel and westerly drifts South of it. In general, the drifts over Georges Bank follow a clockwise rotation around the shoals with a net drift to the West and across Great South Channel.

West of Nantucket Light Vessel there is an observed shoreward bottom drift of about 0.2 to 0.5 nm/day generally found within an area approximately one-half to three-quarters of the distance from the shore to the 50-fathom line. Offshore bottom drift is generally found South and East of this area. This area is believed to shift on- and offshore. The shoreward drift is weakest in the winter months and strongest in the summer months. There is a definite residual drift toward the mouths of estuaries.

The generally accepted mean surface drift of water in the North Atlantic is portrayed in U.S. Naval Oceanographic Office (NAVOCEANO) Publication 700, "Oceanographic Atlas of the North Atlantic Ocean." In the real ocean, the mean circulation is considerably modified by time-dependent meanders of the Gulf Stream, meso-scale (30- to 100-mile diameter) eddies, and meandering "branches" to the North Atlantic Current and currents to the East and Northeast such as the Irish Current, the Norwegian Current, and the Irminger Current. To attempt to realistically estimate the actual North Atlantic surface current field for the ensuing six months was considered an enormous task, yielding at best values of very low confidence. However, a very gross estimate of the dispersion of the oil was attempted using mean winds and mean currents to give some idea where and when the oil might possibly be expected, even if only in the form of tar balls.

The procedure used in making this estimate was to start at the vicinity of 65°N, 40°W on 1 January and add a monthly oil leeway vector (1.2% of the monthly mean wind vector from the U.S. Naval Marine Climatic Atlas of the World (NAVAIR 50-IC-54) and a sea current vector (which is assumed to include the wind current) taken from NAVOCEANO Pub 700. The result of this estimate is displayed in Figure 20 which shows possible paths and arrival times of oil from the major ARGO MERCHANT spills in late December. It is emphasized that Figure 20 shows only possible scenarios. It is unlikely that oil would be found in all of the areas shown in the figure. It is likely that the oil could move more quickly or slowly, by a factor of about 2. It should also be kept in mind that the oil, even at the time of the spill covered much less than 1% of the area within the predicted zone and that the oil could be expected to degrade with time and drifts.

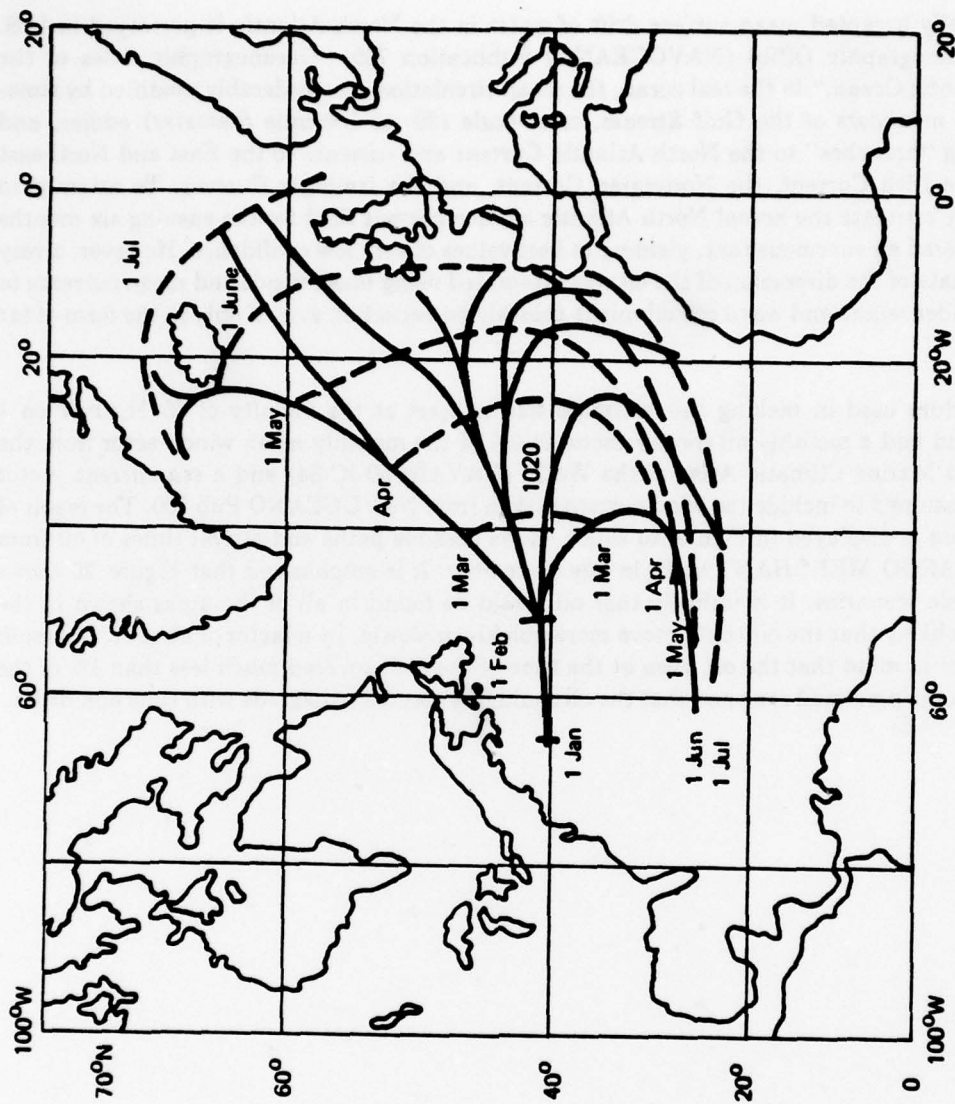


Figure 20 A SPECULATIVE ESTIMATE OF POSSIBLE TRAJECTORIES AND ARRIVAL TIMES
FOR OIL SPILLED FROM ARGO MERCHANT IN DECEMBER 1976

6. COST OF ARGO MERCHANT RESPONSE ACTION

The total cost* of the response action has been calculated at \$1,826,609.10. The financial accounting can be summarized as follows:

1.	Equipment Costs	\$419,441.54
2.	Contract Costs	979,717.80
3.	Purchase Orders	19,399.14
4.	Regular Personnel Costs	54,251.06
5.	Reserve Personnel, Travel, and Per Diem	20,346.83
6.	Strike Team Costs	220,548.15
7.	Other Federal and State Agencies	85,646.49
8.	Miscellaneous Unit Costs	<u>27,260.19</u>
	Total	\$1,826,610.25

The remainder of this section provides an in-depth breakdown of each accountable action.

6.1 EQUIPMENT COSTS

Although the ARGO MERCHANT casualty called for some Search and Rescue (SAR) activities by the Coast Guard, the entire effort was almost entirely directed to the prevention, containment, and control of a major oil spill. The few hours devoted to SAR efforts have been included in the overall spill response action.

Original records for these data consist of unit logs, related message traffic and reports. All costs were computed in accordance with COMMANDANT INSTRUCTION 16465.2A of 4 November 1976.

* The figures in this section are subject to refinement.

A. VESSELS	DOCUMENTATION	COST
(1) USCGC SHERMAN	Ship's logs	
50 hours		
Personnel		\$ 9,885.10
Fuel		4,550.00
Operating and maintenance		8,650.00
Overhead		5,623.98
Depreciation		2,650.00
Equipment lost onboard		—
ARGO MERCHANT		<u>3,628.98</u>
	Total	\$34,788.04
(2) USCGC VIGILANT	Ship's logs	
270 hours		
Personnel		\$21,279.60
Fuel		7,290.00
Operating and maintenance		21,600.00
Overhead		7,872.71
Depreciation		4,860.00
Equipment lost aboard		—
ARGO MERCHANT	memo 5922 1/24/77 with invoices	7,483.00
Repair for small boat		<u>6,483.00</u>
	Total	\$77,223.55
(3) USCGC EVERGREEN	Messages	
64.5 hours	220200Z 12/76	
Personnel	240845Z 12/76	\$ 4,111.40
Fuel	242130Z 12/76	967.50
Operating and maintenance	301721Z 12/76	
	221740Z 2/77	7,675.50
Overhead		3,188.60
Depreciation		387.00
Cleaning oil from hull		<u>32.20</u>
	Total	\$25,062.20
(4) USCGC BITTERSWEET	Deck logs and message traffic	
67 hours		
Personnel		\$ 4,264.24
Fuel		1,005.00
Operating and maintenance		7,973.00
Overhead		3,393.50
Depreciation		402.00
Damaged equipment	memo	<u>1,206.00</u>
	Total	\$18,244.20

B. AIRCRAFT		DOCUMENTATION	COST
(1)	HC130B (Four engine, fixed wing) 25.9 Hours	USCG Air Station Elizabeth City, N.C. Memos 5922 2/8/77 Memo 16480 1/5/77	
	Personnel		\$ 3,380.47
	Fuel		7,438.74
	Operating and maintenance		17,197.60
	Overhead		7,004.20
	Depreciation		<u>3,336.70</u>
		Total	\$35,357.71
(3)	HH-3F (Large Helicopter) 163.0 hours	CO, USCG Air Station, Cape Cod	\$13,253.53
	Personnel		12,704.22
	Fuel	memo 7000 2/11/77	93,562.00
	Operating and maintenance		29,879.94
	Overhead		<u>1,467.00</u>
	Depreciation		
		Total	\$150,856.69
(4)	HH-52A (Small Helicopter) 48.8 hours	CO, USCG Air Station Cape Cod	\$ 1,913.52
	Personnel		1,236.65
	Fuel	memo 7000 2/11/77	11,668.80
	Operating and maintenance		3,704.74
	Overhead		<u>122.40</u>
	Depreciation		
			\$18,646.10
	Deicing fluid for aircraft		<u>2,406.48</u>
		Total	\$21,052.00
C. VEHICLES		DOCUMENTATION	COST
(1)	MSO Boston	MSO Boston	\$ 333.38
	15-24 Dec.		182.30
	25-31 Dec.		224.06
	1-7 Jan.		70.71
	8-14 Jan.		<u>24.49</u>
	15-21 Jan.		
		Total	\$ 834.93
(2)	USCG Base Woods Hole	USCG Base Woods Hole Memo 7000 3/31/77	\$ 66.60

(3) USCG Station
Chatham

USCG Station
Chatham
Memo 3000 3/26/77

\$ 21.00

Total

\$ 922.53

Total - Vessels, Aircraft, and Vehicles

\$419,441.54

6.2 CONTRACT COSTS

ORGANIZATION

TOTAL COST

(1) Murphy Pacific Co., Inc.	\$870,000.00
(2) Moran Towing & Transportation Co.	101,951.86
(3) Marine Towing & Transportation Co.	65,200.00
(4) Jet Line Services Co., Inc.	63,990.34
(5) Coastal Services Co., Inc.	57,107.19
(6) Cannon Engineering Co., Inc.	8,899.72
(7) White Towing and Salvage, Inc.	12,568.75
	<u>\$979,717.86</u>

6.3 PURCHASE ORDERS

A total of 28 purchase orders were issued payment vouchers

\$ 19,399.14

6.4 REGULAR PERSONNEL COSTS

A. Marine Safety Office	\$ 12,577.09
B. First Coast Guard District	22,067.88
C. Atlantic Strike Team	6,973.25
D. Gulf Strike Team	1,258.00
E. USCG Oceanographic Unit, Washington, D.C.	5,694.63
F. USCG Research and Development Center, Groton, Ct.	
• Chemical Branch	2,875.87
• Oceanographic Branch	1,768.05
• Ocean Science Marine Safety Branch	1,036.28
Total Personnel Costs	<u>\$54,251.05</u>

6.5 RESERVE PERSONNEL COSTS

146 days	\$ 7,192.90
Travel and Per Diem	<u>5,386.99</u>
	\$ 12,579.89

6.6 PUBLIC TRANSPORTATION COSTS

Transportation of equipment or personnel by public carriers

\$ 7,765.94

6.7 ATLANTIC STRIKE TEAM EXPENDITURES

A.	Replacement of lost ADAPTS pumping equipment	\$180,841.29
B.	Travel, operating expenses, and replacement of equipment lost on ARGO MERCHANT	<u>39,706.86</u>
	Total	\$220,548.15

6.8 OTHER FEDERAL AND STATE AGENCY COSTS

ORGANIZATION	SERVICE	TOTAL COST
(1) U.S. Air Force	AST transportation	\$ 3,214.00
(2) U.S. Army	Trucks, helicopter and personnel for transportation	8,102.58
(3) U.S. Navy	Salvage ships; USS RECOVERY, DASH, and DETECTOR	12,470.06
(4) U.S. Army Ft. Eustis	Skycrane helicopters, heavy lift equipment	25,000.00
(5) U.S. Dept. of Interior Div. of Fish and Wildlife Services	Bird cleaning	1,507.37
(6) Massachusetts Fisheries and Wildlife Div.	Bird cleaning	12,000.00
(7) U.S. Dept. of Commerce National Oceanic and Atmospheric Administration	Flights to track oil slick	20,600.00
(8) U.S. Environmental Protection Agency	Advisory response service	492.48
(9) Massachusetts National Guard	Aircraft assistance	<u>2,260.00</u>
	Total	\$85,646.49

6.9 MISCELLANEOUS UNIT COSTS

USCG Air Station, Cape Cod	Total	<u>\$27,260.19</u>
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7. COMMENTS AND RECOMMENDATIONS TO PREVENT REOCCURRENCE, IMPROVE RESPONSE ACTIONS, AND IMPROVE NATIONAL AND REGIONAL CONTINGENCY PLANS

7.1 GENERAL COMMENTS

The On-Scene Coordinator has a list of follow-up comments to offer as a result of the grounding and oil spill:

- 7.1.1. The news media and other sources have referred to the ARGO MERCHANT casualty as a response action of the United States Coast Guard; this was not the case. It was a combined *United States Government response action*; the U.S. Army, Navy, Department of Interior, Department of Commerce, Justice Department, Environmental Protection Agency, and the Air Force all participated in the action, as did various departments of the State government. Since the spill occurred in U.S. coastal waters, the U.S. Coast Guard had the responsibility and was in the best position to coordinate the activities of the various Federal and State governmental agencies during the oil spill response action.
- 7.1.2. The primary responsibility of the U.S. Coast Guard following the grounding of the tanker was the safety of that tanker's crew members and saving of the vessel. The Commanding Officer of the USCGC SHERMAN, Captain H.M. Veillette, was On-Scene Commander for the Search and Rescue (SAR) phase. The SAR operation was successful in that all crew members of the ARGO MERCHANT were safely removed from the wreck without personal injury. When it was evident that efforts to save the vessel itself would require massive resources, the emphasis of the governmental response team was to protect the U.S. coastal zone from environmental damage from the discharge of the oil cargo, when primary responsibility shifted to the Federal On-Scene Coordinator.
- 7.1.3. During the course of the response action, and in the months following the disaster, much misinterpreted information was published by the media and in written articles and statements of individuals who lacked first-hand knowledge of on-site conditions and plans of action. The best Federal, State, and commercial experts available were assigned to this catastrophe. Many individuals worked heroically for long hours under most adverse conditions during one of the worst winters experienced in New England. It is hoped that this report will more clearly depict the day-to-day problems during the most massive response effort launched in U.S. coastal waters.
- 7.1.4. This report is directed toward recording the actions and response effort of the On-Scene Coordinator and the Response Teams. It is not intended to define the ecological impact of the spilled oil, which was, however, a major concern during the counter-measure activities.
- 7.1.5. Throughout the response actions there were problems in gaining the use of ships, aircraft, and other major pieces of equipment. None of this equipment was reserved, on standby, to respond to an oil spill. Each piece of equipment owned by the Federal

Government or a State government and its operational personnel are assigned a daily duty; an emergency response obviously removes this equipment from its assigned duty, leaving voids in defense, coastal patrol, search and rescue, and other activities.

During this response, the presumed sinking of the N/V (GRAND ZENITH) off Nova Scotia necessarily committed Coast Guard long-range A/C to that SAR effort. Another oil spill in the Great Lakes area committed a Coast Guard Aircraft for AST delivery. The CHESTER A. POLING sinking and the BNO65 grounding both committed Coast Guard resources, A/C and vessels, to those cases. In like manner, commercially owned equipment cannot be diverted rapidly and readily from regular service for an emergency response action, and, in most cases, some modification of existing equipment is necessary before it can be pressed into a duty other than that for which it was originally designed.

- 7.1.6. An amazing amount of time was taken in briefings of Federal officials, State officials (5 states), municipal government officials, news media, citizen groups (both local and national) and the interested public. Pre-planning of overflights for interested officials was difficult in that most aircraft were operationally committed. The telephones at First District Office, Boston, the Command Post, Cape Cod, Public Affairs trailer, Cape Cod and MSD Boston were busy at all hours of the day and night. (The telephone log for the response period constitutes a very extensive file.) Extra personnel were required to man these stations, diverting them from more productive remedial activities.
- 7.1.7. Within a few days of the incident, an amazing amount of response equipment was marshalled near the casualty site, or placed in readiness on a standby status. This action was taken even though the Intervention Act had not yet been invoked and it was initially uncertain if the casualty would develop into a full-scale pollution control incident.
- 7.1.8. To indicate the characteristics of the casualty site, the following general description is provided from the United States Coast Pilot, Volume 2, Cape Cod to Sandy Hook:

"Nantucket Shoals is the general name of the numerous different broken shoals which lie southeastward of Nantucket Island and make this one of the most dangerous parts of the coast of the United States for the navigator. These shoals extend 23 miles eastward and 40 miles southeastward from Nantucket Island. They are shifting in nature and their depths vary from 3 to 4 feet on some to 4 and 5 fathoms on others, while shoals with depths of 10 fathoms or more lead between those farthest offshore. The easterly edge of the shoals has depths of 3 and 4 fathoms in places.

"The currents in the area are strong and erratic, reaching a velocity of 3 to 5 knots around the edges of the shoals. They are made erratic by the obstruction of the shoals, in some cases being deflected to such an extent as to cause the direction to change 180 degrees from one side of the shoal to the other.

"The tidal current over the shoals is rotary, turning clockwise. Observations in the area indicate an average velocity at strength of about 2.5 knots, but this probably varies appreciably from place to place. Similarly the direction of the current at strength probably depends on the orientation of channels between shoal areas.

"Since the current is rotary, there is no true slack. Observations in the area show an average minimum of about 0.5 knot.

"The tidal current near Nantucket Lightship is rotary, turning clockwise. The average velocity at strength is 0.8 knot; the average minimum is 0.6 knot.

"Hourly average velocities and directions for Davis Bank and the area near Nantucket Lightship, referred to predicted times of maximum flood at Pollock Rip Channel, are furnished in the Tidal Current Tables. However, the tidal currents are appreciably influenced by winds.

"Nantucket Shoals should be entirely avoided by deep-draft vessels when possible and by light-draft vessels without local knowledge, on account of the treacherous currents. There are, however, channels through these various shoals which can be negotiated with local knowledge and caution. In calm weather at slack water these shoals are sometimes difficult to see, and a vessel is liable to be taken into shoaler water than was intended.

"Calm, clear days are few; when the sea is calm it is usually foggy, and when clear, it is usually rough. Also a considerable amount of hazy weather is to be expected which limits visibility.

"Should it become necessary to anchor in this area, open sea anchorage may be had anywhere that depths permit. Due consideration should be given to the close proximity of shoals and possibility of dragging due to the winds and currents. Generally it has been found best to avoid the deeper channels and, when rougher water is experienced, to anchor in the lee of a shoal which would tend to knock down the heavier swells. A scope of five to one or greater should always be used.

"Nantucket Shoals is made up of the following parts:

"**Phelps Bank**, the southeasternmost part of the Nantucket Shoals, is about 6.5 miles long and 2.5 miles wide.

"**Asia Rip**, the shoalest point of the bank with 5 $\frac{3}{4}$ fathoms, is at the southern end. The wreck of the SS OREGON, covered at 3 $\frac{1}{4}$ fathoms, is at 40°45'N, 69°19'W, 3 miles South-southeastward of Asia Rip. A lighted gong buoy is about 1 mile southward of the wreck.

"**Middle Rip**, with a least-found depth of 4 fathoms and lying North-northwest of Phelps Bank, is about 13.5 miles long and 4.5 miles wide. This shoal consists of two large parts with depths of 4 fathoms on the East and 6 $\frac{1}{4}$ fathoms on the West, separated by a channel with a depth of 7 fathoms and four outlying shoals of 8 to 10 fathoms. A lighted whistle buoy is about 12 miles eastward of Middle Rip.

"**Fishing Rip**, bow-shaped, with depths of 3 to 10 fathoms, is about 26 miles long North and South and 6.5 miles wide at its widest point. The North point is 20 miles 073°T and the South point is 27.5 miles 136°T, respectively, from Sankaty Head Light. A wreck is reported to lie about 5 miles Northeast of the southernmost part of the shoal and on the outer edge of the rip.

"The unmarked channel westward of Fishing Rip is obstructed by three shoals in the northern section which have least-found depths of 7 $\frac{1}{2}$, 4 $\frac{1}{4}$, and 10 fathoms. In the southern part of this channel are four shoals with depths of 8 to 10 fathoms.

"Davis Bank, the innermost of the outer Nantucket Shoals, is bow-shaped and has depths of 2¾ to 10 fathoms of water over it. The bank is about 30 miles long North and South and has a greatest width of 4 miles. The wreck of the vessel PROGRESS is off the inner edge of the bank about 13 miles North-northeastward of the southern end of the bank.

"The channel westward of Davis Bank is marked at each end by a lighted buoy. The use of this channel should be restricted to clear weather due to the strong currents encountered throughout this area."

* * * * *

One unusual circumstance worthy of record is the fact that, within only 500 yards of the ARGO MERCHANT grounding site, water conditions were appreciably calmer and less current was evident than at the actual wreck site on the shoal.

- 7.1.9. Once it had been established that wind and weather conditions were such that the movement of the oil slick could be predicted and that the U.S. coastal area was no longer in immediate danger of oil contamination, the contractor at Chatham was released (3 January), plans were made to release the clean-up contractor on Nantucket in the near future, and an adequate Contingency Plan with response times was developed. However, after the officials of the Commonwealth of Massachusetts objected, and following consultation with the District Commander and later the RRT and NRT, the contractors were retained on standby status until it was determined on 10 February that no substantial amount of oil remained in the wreck.
- 7.1.10. Numerous reports and articles published during and after the casualty have stated that, following the break-up of the ARGO MERCHANT, the bow section was afloat. This was never the case; the bow section was grounded in direct contact with the shoal, in an upright position, due to the support from reserve buoyancy developed by air trapped within the forward section of the bow. Towing of this section was thoroughly considered and found not feasible after study by a Naval Architect.
- 7.1.11. The DOC/NOAA response in providing scientific investigations was invaluable to the OSC during the actual response efforts and in providing public information. Of special assistance were bathythermographic investigations to determine water temperatures at depth, current measuring, water sampling, and the use of drift cards distributed inshore of the spill to give early warning of any movement toward the shoreline. The considerable effort by DOC/NOAA to publish a preliminary scientific report on the impact of the casualty is worthy of special mention. This report, published in March 1977, gave the general public great insight into the scientific aspects of the spill in the shortest possible time. The participation by NOAA members in news conferences and briefings was also of great assistance.
- 7.1.12. Color slides and videotapes were taken of the wreck site on days when weather permitted this action. These videotapes were of great help to the OSC in that they eliminated the need for him to make daily overflights. These videotapes were also an invaluable tool for the public affairs side of the spill countermeasure action. However, overflights and aerial photography were only possible during relatively favorable

weather conditions. The resulting scenes of relatively calm conditions were not indicative of on-site weather conditions. These tapes and photos, when viewed totally, may give a false impression that weather conditions were good at most times during the spill response.

7.2 RECOMMENDATIONS

7.2.1 Staffing

- U.S. Coast Guard instructions should define clearly who will act as predesignated OSC in the rest of the zone COTP/MSO while a major spill is in progress. An alternate should be ready to assume responsibility in the event that more than one spill is experienced within the area. Multiple incidents may not be a major problem in large Captain-of-the-Port commands. They could, however, pose a problem of considerable importance in a small Marine Safety Office with limited staffing. This OSC obtained a set of orders to the Command post, thus allowing the Executive Officer to become ACTING COTP and OCMI for the rest of the zone.
- A contracting officer and/or a Chief Storekeeper should be assigned as a permanent part of the OSC's staff during a major spill countermeasure action.
- A fully operational command post should be established promptly. The post should be as close to the spill site as geography and conditions permit.
- The assignment of the USCG District Chief of Staff as Chairman of the Regional Response Team (RRT) should be considered. This action would facilitate crossing of lines of authority within the USCG structure, and aid in obtaining vessel and aircraft resources, obtaining reserve augmentation and personnel augmentation from other units.
- Each predesignated OSC should be formally trained in spill response techniques prior to his designation as an OSC. This training should also include some public affairs and information instruction tailored to USCG needs and procedures for releasing oil spill response information.
- A trained aerial observer should be assigned to the staff of each OSC during a massive spill response action. During the ARGO MERCHANT response, algae, seaweed, and other phenomena were mistaken for oil slicks. Surface vessels were then diverted to these sites and additional expenditures were incurred.
- A USCG/HQ public affairs representative, fully familiar with existing and proposed regulations on items such as double hulls, double bottoms, offshore oil production, submarine pipelines, etc., should be assigned to the response team. This representative should be responsible for answering public information requests on such regulations, relieving the OSC and his working staff from such duty.
- Arrangements should be made prior to a spill action to gain more effective coordination with the USDOL/Fish and Wildlife Service with respect to the handling and

cleaning of oil-contaminated birds and other wildlife. The OSC should have full interest in this response phase, but should not have the burden of answering technical questions and logistical problems without direct communication with the FWS.

- The OSC should maintain his own log of actions taken. This has proven invaluable at the several GAO audits, when giving testimony, and in reviewing the case. There are many decisions/determinations made during meetings which cannot otherwise be documented in formal communications such as POLREPS. At times, the decision NOT to proceed with an action has been considered as important as the actions taken.
- Each OSC should be assigned a scientific advisor (oceanographer) for the duration of the response action to interface with the scientific community on scene. This expertise should include: current measurement, surface slick movement prediction, wind and wave action, deep water and bottom sediment sampling, and ecological and environmental impact analysis. In general, this person would act as scientific coordinator for commitment of response resources and advisor to governmental agencies, academic institutions, and public information sources.
- During massive spill response actions, the designated OSC should be relieved of all other work assignments not associated with the present action. Similarly, the OSC should not be required to undertake the responsibility of more than one response action. During this response action, four additional polluting incidents occurred, specifically two tanker sinkings, spillage from a fishing vessel and a grounded fishing vessel, a barge grounding, and a massive beach cleanup action (none from ARGO MERCHANT).
- The Commandant, USCG, should fund the development and printing of the OSC's report or provide a team of specialists for this purpose on all spills of significant interest. There is a notable lack of resources in a small USCG/Marine Safety Office to conduct this type of report writing, the content of which may be of international interest.

7.2.2 Authority

- The role and responsibilities of the Oceanographic Unit and the Coast Guard Research and Development Center for oil slick movement forecasting, oil typing and "fingerprinting" (matching) should be addressed and formalized. The extent of their anticipated support to the OSC should be clearly delineated.
- All OSC's and RRT's should make themselves aware of the recommendations and provisions of the International Convention for the Prevention of Pollution of the Sea by Oil, 1954, Art. 4(a) as amended, 1969. This law is directly related to the discharging of oil into the open ocean for the purpose of securing the safety of the vessel.
- The relationship of the District Commander in the OSC's chain of command should be recognized and addressed in suitable directives. It is not addressed in the National Contingency Plan.

7.2.3 Priorities

- The possible need to flood a grounded vessel by the use of shellfire should be determined at an early stage in the response action. Such flooding could stabilize the vessel and prevent it from breaking up or moving under adverse weather conditions. A request to shell and flood was initially denied during the ARGO MERCHANT casualty. The bow section dragged along the bottom for a considerable distance due to reserve buoyancy forward. It then required a week of searching, using minisweepers, MAD-equipped aircraft, and the USS RECOVERY to locate it.
- Personnel safety (loss of life and/or injury) should be given preference at all times over salvage or ship cargo recovery attempts. Oil recovery from a wreck, or the sea surface, at distances of between 30 to 100 nm is not practical with present state-of-the-art equipment and lives should not be endangered during attempts to do so. The use of the 36-foot MARKO skimmers, deployment of booms, etc., were not initiated for this reason, although public pressure to try anything was great.

7.2.4 Coordination

- The predesignated OSC should arrange to meet at least once with all members of the Regional Response Team (RRT). He should be aware of existing and new appointments and become familiar with their areas of expertise. He should assure himself that the RRT members agree with the OSC in the delineation of their respective roles.

7.2.5 Equipment

- The Regional Contingency Plan data base should include a current listing of all available tug and barge operators with a complete inventory of their equipment.
- NOAA can provide, on short notice, a total of 23 long-range aircraft. Each predesignated OSC should maintain a contact point number to arrange for interagency use of these aircraft.
- The OSC should not hesitate to hire outside resources when no USCG resources are expected to become immediately available.
- It should be determined if, in the event of an emergency, an OSC can use commercially-owned marine equipment to press them into a spill response action. The legality of such action should be investigated and made known to predesignated OSC's.
- The predesignated OSC should determine and document where aircraft and truck loading/unloading equipment can be obtained readily. A successful response action requires that this type of logistical equipment be made available with a minimum of delay since small airports do not own and maintain such equipment.

7.2.6 Public Relations

- An aggressive public information response should be made early in each spill response action. It should be clearly indicated that each response action is federally instigated, warranting the full coordination of many agencies. The public should be made aware that the responsibility for spill countermeasures and mitigation of damage is *not* solely that of the U.S. Coast Guard.
- To avoid constant requests from representatives of the news media for news concerning spill response progress, a regular daily press conference should be scheduled by the OSC during duration of the action. At the appointed hour, radio, television, and press representatives should be given a complete briefing on the situation to date. It should be made clear that the OSC will not be available at other times (except for unusual reports) and that updates will be made by the Public Affairs staff as they occur.
- A member of US/EPA should be included in all press conferences, at which the use of burning and gelling agents and dispersants is discussed, recognizing that agency's prime responsibility in this area as assigned by the National Contingency Plan.

7.2.7 Inventory of Available Information and Resources

- It is imperative to the success of a spill response action that equipment and personnel listing of national sources and of other agencies be kept current and available to the OSC. Full consideration should be given to infrared aerial photography, satellite support, long- and short-range aircraft, salvage vessels and federally owned equipment under the care and custody of other Federal agencies such as DOD.
- The services of the USCG Merchant Marine Technical staff should be used to advantage to obtain any naval architectural data that may pertain to flooding and ship stability.
- Each predesignated OSC should develop an inventory of bird sanctuaries and state and/or privately funded facilities that can undertake the responsibility for cleaning oil-contaminated birds and storing same until they are ready for release.
- Ship plans and loading manuals of a stricken vessel can be invaluable during a response action and should be obtained from the first available source. The plans used during the ARGO MERCHANT response action were obtained from the American Bureau of Shipping in New York City.

APPENDIX I
HIGH SEAS — INTERVENTION P.L. 93-248

INTERVENTION ON THE HIGH SEAS ACT*For Legislative History of Act, see p. 2773***PUBLIC LAW 93-248; 88 STAT. 8**

[S. 1070]

An Act to implement the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That:

This Act may be cited as the "Intervention on the High Seas Act".

Sec. 2. As used in this Act—

(1) "ship" means—

(A) any seagoing vessel of any type whatsoever, and

(B) any floating craft, except an installation or device engaged in the exploration and exploitation of the resources of the seabed and the ocean floor and the subsoil thereof;

(2) "oil" means crude oil, fuel oil, diesel oil, and lubricating oil;

(3) "convention" means the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969;

(4) "Secretary" means the Secretary of the department in which the Coast Guard is operating; and

(5) "United States" means the States, the District of Columbia, the Commonwealth of Puerto Rico, the Canal Zone, Guam, American Samoa, the Virgin Islands, and the Trust Territory of the Pacific Islands.

Sec. 3. Whenever a ship collision, stranding, or other incident of navigation or other occurrence on board a ship or external to it resulting in material damage or imminent threat of material damage to the ship or her cargo creates, as determined by the Secretary, a grave and imminent danger to the coastline or related interests of the United States from pollution or threat of pollution of the sea by oil which may reasonably be expected to result in major harmful consequences, the Secretary may, except as provided for in section 10, without liability for any damage to the owners or operators of the ship, to her cargo or crew, or to underwriters or other parties interested therein, take measures on the high seas, in accordance with the provisions of the Convention and this Act, to prevent, mitigate, or eliminate that danger.

Sec. 4. In determining whether there is grave and imminent danger of major harmful consequences to the coastline or related interests of the United States, the Secretary shall consider the interests of the United States directly threatened or affected including but not limited to, fish, shellfish, and other living marine resources, wildlife, coastal zone and estuarine activities, and public and private shorelines and beaches.

Sec. 5. Upon a determination under section 3 of this Act of a grave and imminent danger to the coastline or related interests of the United States, the Secretary may—

(1) coordinate and direct all public and private efforts directed at the removal or elimination of the threatened pollution damage;

(2) directly or indirectly undertake the whole or any part of any salvage or other action he could require or direct under subsection (1) of this section; and

(3) remove, and, if necessary, destroy the ship and cargo which is the source of the danger.

Sec. 6. Before taking any measure under section 5 of this Act, the Secretary shall—

(1) consult, through the Secretary of State, with other countries affected by the marine casualty, and particularly with the flag country of any ship involved;

(2) notify without delay the Administrator of the Environmental Protection Agency and any other persons known to the Secretary, or of whom he later becomes aware, who have interests which can reasonably be expected to be affected by any proposed measures; and

(3) consider any views submitted in response to the consultation or notification required by subsections (1) and (2) of this section.

Sec. 7. In cases of extreme urgency requiring measures to be taken immediately, the Secretary may take those measures rendered necessary by the urgency of the situation without the prior consultation or notification as required by section 6 of this Act or without the continuation of consultations already begun.

Sec. 8. (a) Measures directed or conducted under this Act shall be proportionate to the damage, actual or threatened, to the coastline or related interests of the United States and may not go beyond what is reasonably necessary to prevent, mitigate, or eliminate that damage.

(b) In considering whether measures are proportionate to the damage the Secretary shall, among other things, consider—

(1) the extent and probability of imminent damage if those measures are not taken;

(2) the likelihood of effectiveness of those measures; and

(3) the extent of the damage which may be caused by those measures.

Sec. 9. In the direction and conduct of measures under this Act the Secretary shall use his best endeavors to—

(1) assure the avoidance of risk to human life;

(2) render all possible aid to distressed persons, including facilitating repatriation of ships' crews; and

(3) not unnecessarily interfere with rights and interests of others, including the flag state of any ship involved, other foreign states threatened by damage, and persons otherwise concerned.

Sec. 10. (a) The United States shall be obliged to pay compensation to the extent of the damage caused by measures which exceed those reasonably necessary to achieve the end mentioned in section 3.

(b) Actions against the United States seeking compensation for any excessive measures may be brought in the United States Court of Claims, in any district court of the United States, and in those courts enumerated in section 460 of title 28, United States Code. For purposes of this Act, American Samoa shall be included within the judicial district of the District Court of the United States for the District of Hawaii, and the Trust Territory of the Pacific Islands shall be included within the judicial districts of both the District Court of the United States for the District of Hawaii and the District Court of Guam.

Sec. 11. The Secretary of State shall notify without delay foreign states concerned, the Secretary-General of the Inter-Governmental Maritime Consultative Organization, and persons affected by measures taken under this Act.

Sec. 12. (a) Any person who—

(1) willfully violates a provision of this Act or a regulation issued thereunder; or

(2) willfully refuses or fails to comply with any lawful order or direction given pursuant to this Act; or

(3) willfully obstructs any person who is acting in compliance with an order or direction under this Act, shall be fined not more than \$10,000 or imprisoned not more than one year, or both.

(b) In a criminal proceeding for an offense under paragraph (1) or (2) of subsection (a) of this section it shall be a defense for the accused to prove that he used all due diligence to comply with any order or direction or that he had reasonable cause to believe that compliance would have resulted in serious risk to human life.

Sec. 13. (a) The Secretary, in consultation with the Secretary of State and the Administrator of the Environmental Protection Agency, may nominate individuals to the list of experts provided for in article III of the convention.

(b) The Secretary of State, in consultation with the Secretary, shall designate or nominate, as appropriate and necessary, the negotiators, conciliators, or arbitrators provided for by the convention and the annexes thereto.

Sec. 14. No measures may be taken under authority of this Act against any warship or other ship owned or operated by a country and used, for the time being, only on Government noncommercial service.

Sec. 15. This Act shall be interpreted and administered in a manner consistent with the convention and other international law. Except as specifically provided, nothing in this Act may be interpreted to prejudice any otherwise applicable right, duty, privilege, or immunity or deprive any country or person of any remedy otherwise applicable.

Sec. 16. The Secretary may issue reasonable rules and regulations which he considers appropriate and necessary for the effective implementation of this Act.

Sec. 17. The revolving fund established under section 311(k) of the Federal Water Pollution Control Act shall be available to the Secretary for Federal actions and activities under section 5 of this Act.

Sec. 18. This Act shall be effective upon the date of enactment, or upon the date the convention becomes effective as to the United States, whichever is later.

Approved Feb. 5, 1974.